" PROSPECTIVE RANDOMISED CONTROL STUDY COMPARING THE INCIDENCE OF POSTDURAL PUNCTURE HEADACHE FOLLOWING SPINAL ANAESTHESIA USING 25 GAUGE WHITACRE SPINAL NEEDLE AND 25 GAUGE QUINCKE SPINAL NEEDLE IN OBSTETRIC PATIENTS"

Dissertation submitted to

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CERTIFICATE

This is to certify that the dissertation entitled,**"Prospective randomised control study for comparing the incidence of postdural puncture headache following spinal anaesthesia using 25 gauge Whitacre and 25 gauge Quincke spinal needle in obstetric patients"** submitted by **Dr.G.MALINI**, in partial fulfilment for the Degree of Doctor of Medicine in Anaesthesiology by the Tamilnadu Dr. M.G.R. Medical University, Chennai., is a bonafide record of the work done by her in the **GOVT. KASTHURBA GANDHI HOSPITAL FOR WOMEN AND CHILDREN, TRIPLICANE, CHENNAI,** during the academic year 2013 – 2014.

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DECLARATION

I, **Dr. G.MALINI**, solemnly declare that this dissertation entitled **"Prospective randomised control study for comparing the incidence of Postdural puncture following spinal headache in using 25gauge Whitacre and 25 gauge Quincke spinal needle in obstrtric patients"** is a bonafide work done by me in the Institute of Social Obstetrics Government Kasthurba Gandhi Hospital for Women and Children, Triplicane, Chennai, during the period 2013 to 2014 under the guidance of **Prof. Dr. G.R. Rajashree, M.D. D.A.,** Professor of Anaesthesiology and **Prof. Dr. B.KALA, M.D.,D.A, Director, Institute of** Anaesthesiology and Critical Care, Madras Medical College, Chennai – 3 and submitted to **The TamilnaduDr. MGR Medical University,** Guindy, Chennai – 32, in the partial fulfillment of the requirements for the award of the degree of MDAnaesthesiology (Branch X).

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LIST OF ABBREVIATION USED

CNS	:	Central nervous system
CVS	:	Cardiovascular system
CSF	:	Cerebrospinal fluid
EBP	:	Epidural blood patch
GIT	:	Gastrointestinal system
MAP	:	Mean arterial blood pressure
mg/dl	:	Milligrams per deciliter
PDPH	:	Postdural puncture headache
SAB	:	Subarachnoid block

ABSTRACT

BACKGROUND AND OBJECTIVES

Spinal anaesthesia is one of the most commonly used regional technique in anaesthesia. It is economical,safe and cost effective.Preferred technique of choice in obstetric patients.

The objective of the present study is to compare the incidence of Postdural puncture headache in obstetric patients following spinal anaesthesia using 25 gauge Whitacre and 25 gauge Quincke spinal needles.

METHODOLOGY

This one year randomized control study was conducted in the Department of Anaesthesiology, Institute of Social Obstetrics, Government Kasthurba Gandhi Hospital For Women And Child, Triplicane, Chennai-5, during the year 2013-2014. Obstetric patients posted for elective LSCS were included in the study. The Institutional Ethical Committee clearance and written informed consent from the patients obtained. Incidence of PDPH following spinal anaesthesia ,number of attempts for a successful blockade and failed blocks are assessed.

RESULTS

In this study, study groups contain subjects with same demographic characters like age, height and weight. The occurance of PDPH was meaningfully less(3.3%) when pencil point whitacre is used compared to cutting quincke babcocks needle (10.8 %).

It was mild in 6%, moderate in 12%, severe in 6% of patients in whitacre group. In quincke group it was mild in 29%, moderate in 35%, severe in 5%

INTERPRETATION AND CONCLUSION

There is a real advantage of using pencil point whitacre needle in comparison to cutting bevelled quincke needle.

KEYWORDS

Post dural puncture headache , failed spinal, subarachnoid block,quincke needle, whitacre needle

INTRODUCTION

INTRODUCTION

Subarachnoid block is the widely used technique by the anaesthesiologist worldwide. Spinal anaesthesia dates back to late 1800 with the work of Wynter,Quincke and Corning. However Dr.Karl August Bier is given the credit for introducing spinal anaesthesia into clinical practice in 1898.

The main advantage of SAB is due to its

- simplicity.
- ease of performance.
- requirement of minimal apparatus.
- minimal effect on blood biochemistry
- conscious patient maintaining airway
- good immediate postoperative pain relief
- blunts stress response to surgery
- decreased thromboembolic events

Though popular still,subarachnoid block is not without complications. One of the common complication is Postdural puncture

headache. Bier gained first-hand experience of the disabling headache related to dural puncture. He correctly summarized that the headache was related to excessive loss of CSF.

PDPH causes considerable morbidity, with symptoms lasting for several days, at times severe enough to immobilize the patients. It increases the duration of hospital stay. In addition to this, it warrents a battery of investigations to rule out different causes of headache. This PDPH is more distressing to the mother who is supposed to take care of the newborn baby.

There are lot of studies done regarding the measures for the reduction of PDPH. It is said that with the help of fine gauge spinal needle and needle tip modification, we can reduce the incidence to a greater extend.

The 25 gauge Quincke babcock with medium cutting bevel is the most popular and widely used spinal needle. A balance has to be done between the incidence of PDPH and the technical difficulties with the use of fine gauge spinal needles.

My study is to compare the incidence and the severity of PDPH in obstetric patients using 25 gauge cutting tip Quincke spinal needle and 25 gauge pencil tip Whitacre spinal needle

AIMS AND OBJECTIVES

AIM OF THE STUDY

The aim of the study is to compare the incidence of PDPH,using 25 gauge Quincke spinal needle and 25 gauge Whitacre spinal needle in obstetric patients.

PRIMARY AIM

Incidence and Severity of PDPH.

SECONDARY AIM

Number of attempts for successful blockade.

Number of failed blocks.

ANATOMY OF SUBARACHNOID SPACE

ANATOMY OF THE SUBARACHNOID SPACE

The key to successful subarachnoid blockade is combining appropriate technique with a three dimensional picture and appreciation of vertebral anatomy.

VERTEBRAL COLUMN

It consists of 33 vertebra.

- 7 cervical
- 12 thoracic
- 5 lumbar
- 5 fused sacral
- 4 fused coccygeal bone.

VERTEBRAL CANAL

The bony canal is formed by the body of vertebra anteriorly, posteriorly by two pedicles and the laminae connecting the pedicles. This canal protects the spinal cord and contains spinal cord with surrounding spinal meninges, spinal nerves and cerebrospinal fluid. The lamina gives rise to the transverse process laterally and the spinous process posteriorly.

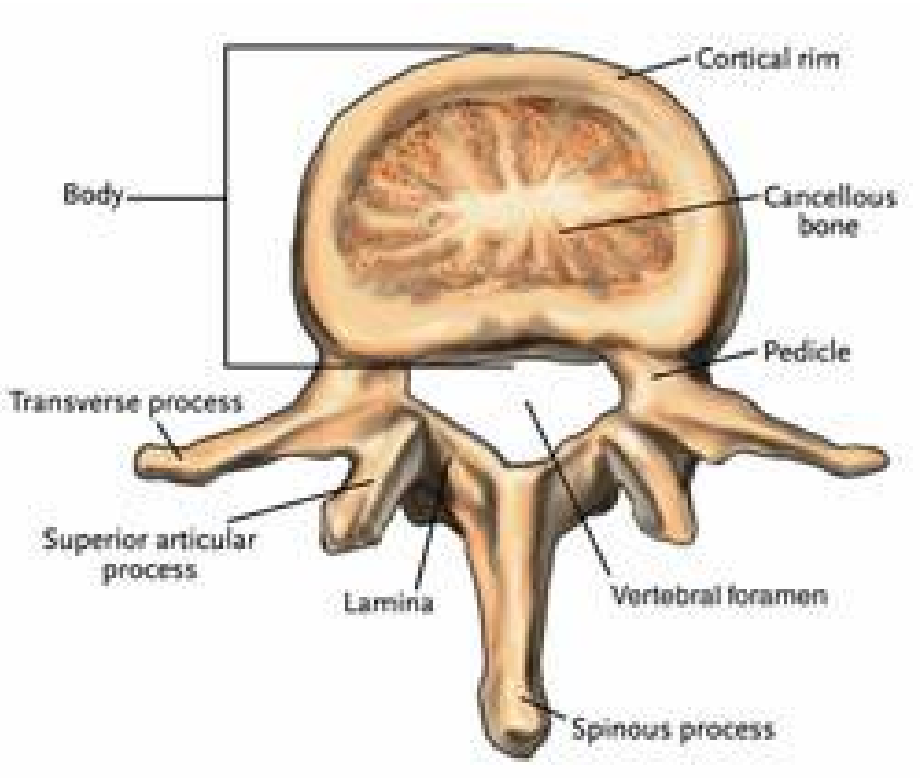


Figure 1 : Lumbar Vertebra

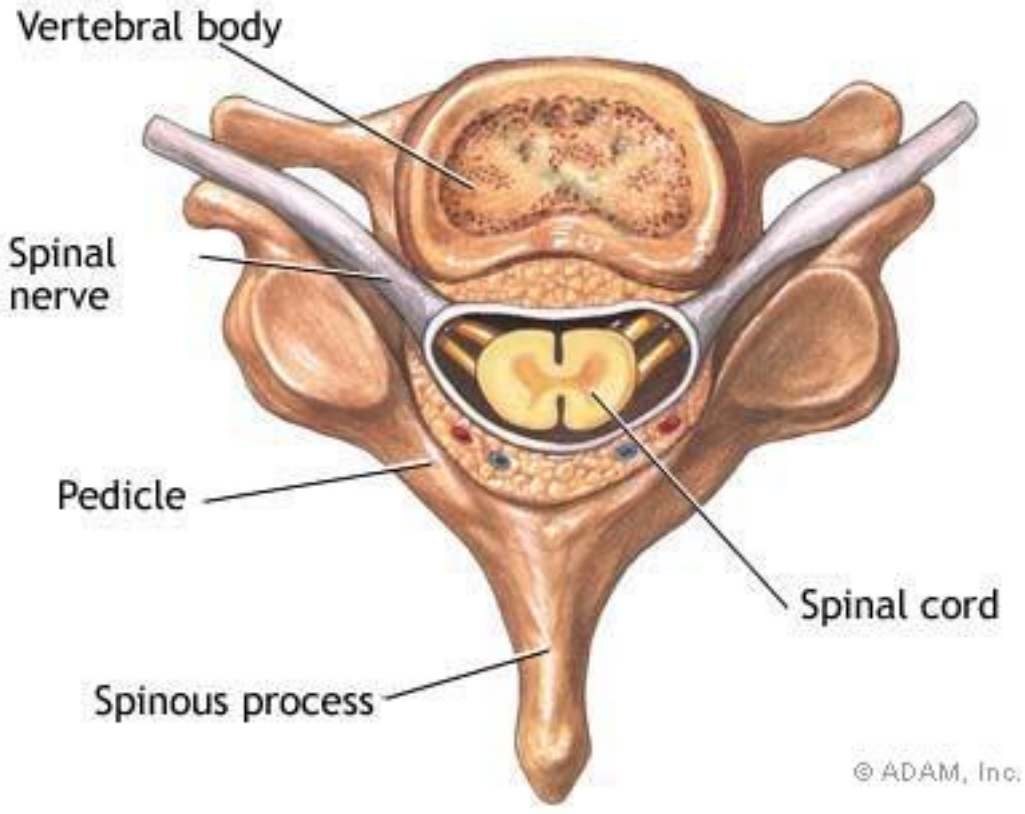


Figure 2 : Vertebra and spinal cord

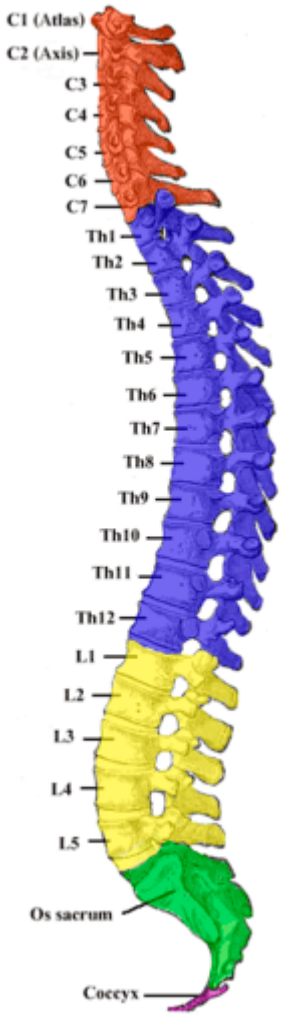


Figure 3 : Vertebral column

CURVES OF SPINE

There are 4 curves. They are

i. Cervical curve-convex anteriorly.

ii. Dorsal curve-concex posteriorly.

iii. Lumbar curve-convex anteriorly.

iv. Sacrococcygeal-convex posteriorly.

These curves are important when the patient lies supine and these can be modified by posture and the flexibility of the spine.

The highest point is at the level of L3 and the lowest point is at T5 level.

In Pregnancy, the lumbar curve is exaggerated

STRUCTURES PIERCED

The following structures are pierced when performing a SAB

- skin and subcutaneous tissue
- supraspinous ligaments
- interspinous ligament
- ligamentum flavum
- areolar tissue or epidural space
- duramater

ANATOMY OF LIGAMENTS

(i) SUPRASPINOUS LIGAMENT

It is a strong, thick, fibrous band extending from the spine of seventh cervical vertebra to the sacral spine.

(ii) INTERSPINOUS LIGAMENTS

It is a thin, fibrous structure connecting adjacent spines. These fibres meet supraspinous ligament posteriorly and blend with ligamentum flavum anteriorly.

(iii) LIGAMENTUM FLAVUM

It is a yellow elastic tissue, perpendicular fibres running from the anterior inferior surface of upper lamina to the antero superior surface of the lower lamina. It exist as right and left half in each intervertebral space, with the halves fusing in midline.

TOPOGRAPHIC LINE OF TUFFIERS

A line joining the highest point of the iliac crest passes over the spine of the fourth lumbar vertebra in the upright position or between L4-L5 interspace in the lateral position is called Tuffiers line.

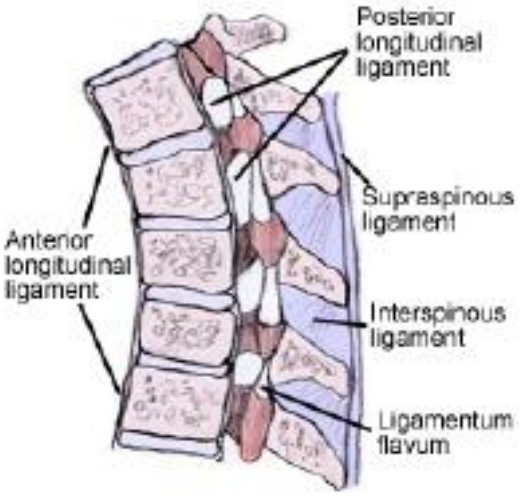


Figure 4 : Structures pierced

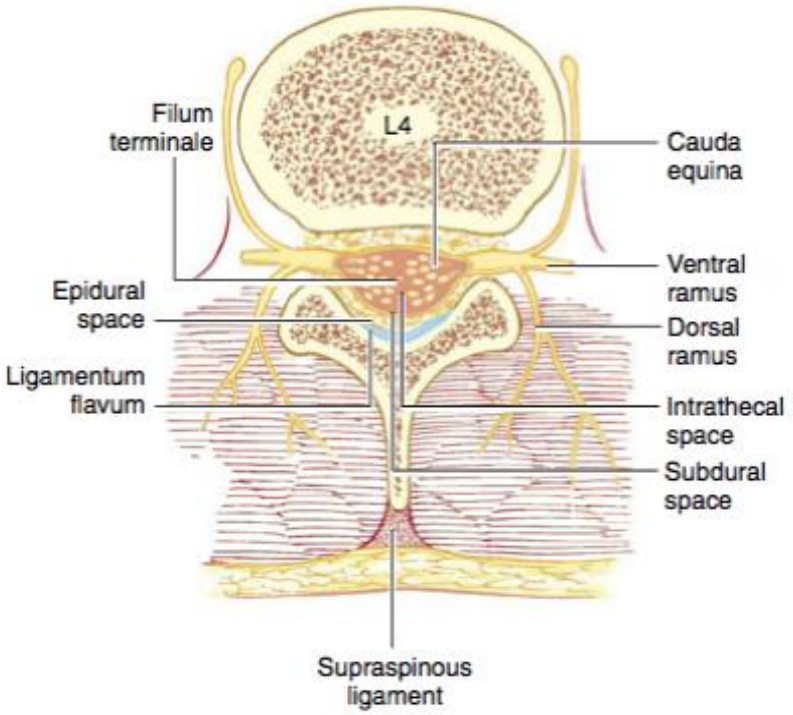


Figure 5 : Intrathecal Space

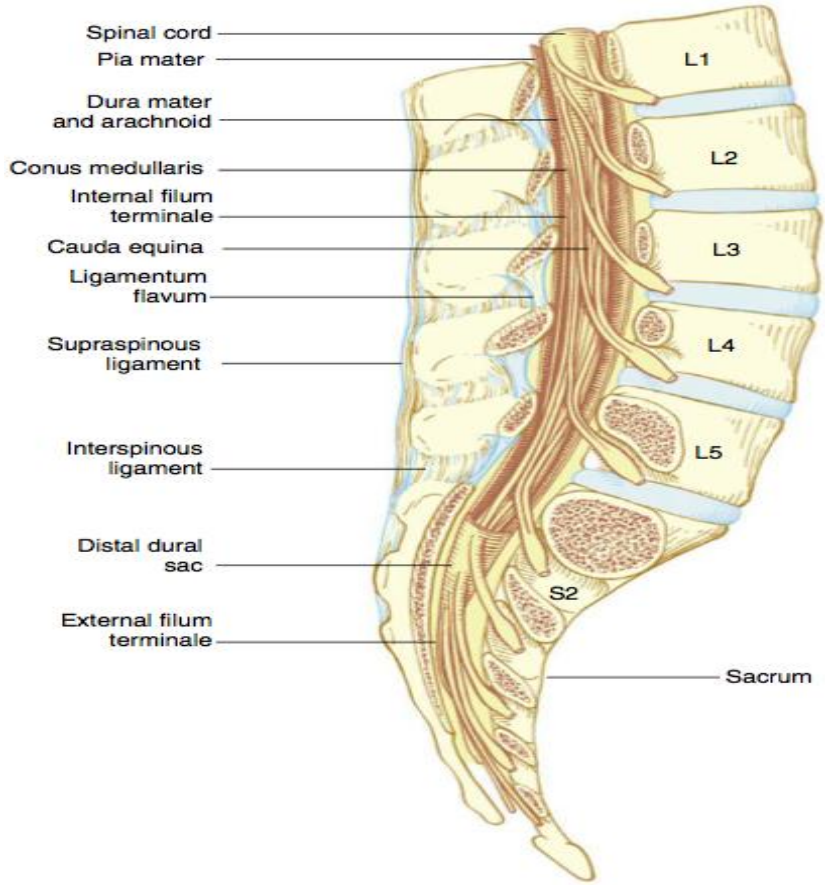


Figure 6 : Coverings of Spinal Cord

SPINAL CORD

The spinal cord is surrounded by three protective membranes duramater, piamater, arachnoid mater, which are continuous with cranial meninges. It is continuous cephalad with the brain stem through the foramen magnam and terminates distally in the conus medullaris. Differential growth rates between the bony vertebral canal and CNS causes this distal termination to vary from L3 in infants to lower border of L1 in adults.

SUBARACHNOID SPACE

It is the space between piamater and arachnoidmater. It has CSF, Spinal nerves, trabecular network between the membranes, blood vessels that supply the spinal cord, lateral extension of piamater, dentate ligaments providing lateral support from the spinal cord to the duramater. The subarachnoid space ends at the level of S2.

SPINAL MEMBRANES

Innermost layer is the piamater, which is highly vascular and closely invest the spinal cord.

Middle layer is arachnoid mater which is non-vascular, delicate membrane closely attached to the outermost layer-the duramater.

Duramater is outermost, randomly organized fibroelastic membrane, which extends from foramen magnum to S2,where the filumterminale blends with the periostium in coccy

CEREBROSPINAL FLUID

It is a complex solution produced by plasma ultra filteration in choroid plexus within cerebral ventricles.

Volume of CSF-100 to 160ml.

Rate of production-20 to 25ml/hr.

Absorbed in the arachnoid villi in the superior saggital sinus and/or into lymphatics via perineural sheaths of cranial and spinal nerves.

CSF contains

Proteins	:	15-45mg/dl
Glucose	:	50-80mg/dl
Non protein	:	20-30mg/dl
Chloride	:	120-130meq/l
Sodium	:	140-150meq/l
Bicarbonate	:	25-30meq/l
PH	:	7.4-7.6

ARTERIAL BLOOD SUPPLY

Anterior two third of spinal cord is supplied by anterior spinal artery, formed at foramen magnum by a branch from terminal portion of vertebral artery.

Posterior one third is supplied by two pairs of posterior spinal artery derived from vertebral artery directly or from posterior inferior cerebellar artery.

One of the anterior radicular branches arising from segmental artery is considerably large and called Artery Of Adamkiewics. It provides rich reinforcement to the flow of anterior spinal artery in its lower distribution. It arises from the descending aorta at the lower thoracic or upper lumbar level usually on the left side

VENOUS DRAINAGE

Veins are situated in the piamater. They are six in numbers and form longitudinal plexiform channels after draining the parenchyma of the cord. They emerge chiefly from the median fissure of the cord and are larger in lumbar region. In this plexus, there are

i. two median longitudinal veins,one anterior in the anterior fissure and the other in the posterior sulcus of the cord.

ii. four lateral longitudinal veins,one pair runs dorsal to the attachment of nerve roots and the other ventral to the nerve root.

These veins communicate with the internal vertebral plexus, from which blood drains into intervertebral veins. It then drains into segmental veins and external vertebral plexus.

Near the base of the skull, the longitudinal channels surrounding the cord units and form two or three small trunks, which communicate with internal vertebral plexus, then intervertebral veins and the segmental veins, then with cranial venous sinuses, ending in inferior petrosal sinuses.

VEINS OF THE VERTEBRAL COLUMN:

The plexuses and the veins of the vertebral system are

- External plexus
- Internal plexus
- Basivertebral veins
- Intervertebral veins
- Spinal cord veins

PHYSIOLOGY OF SPINAL ANAESTHESIA

PHYSIOLOGY OF SPINAL ANAESTHESIA

The principle site of action of SAB is believed to be the nerve root. Local anaesthetic agent injected into the subarachnoid space, baths the nerve roots floating in CSF. They act by blocking the neural transmission in the posterior nerve roor fibres and interrupts somatic and visceral sensation. They block the anterior nerve root fibre also and prevent efferent motor and autonomic outflow.

SOMATIC BLOCKADE

SAB provides excellent muscle relaxation by blocking afferent transmission of painful stimuli and efferent impulse responsible for skeletal muscle tone. Sensory blockade interrupts both somatic and visceral painful stimuli. The size and character of the fibre type and the fact that the concentration of local anaesthetic agent decreases with increasing distance from the level of injection, explains the phenomenon of Differential Blockade.

Differential Blockade results in sympathetic blocked(judged by temperature sensitivity),that may be two segments or more cephalad than the sensory block (pain, light touch),which, in turn, is usually several segments more cephalad than motor blockade.

AUTONOMIC BLOCKADE

Interruption of efferent autonomic transmission at the spinal nerve roots during neuraxial block produces sympathetic blockade. The physiological response of neuraxial blockade results from decreased sympathetic tone and/or unopposed parasympathetic tone.

CARDIOVASCULAR MANIFESTATIONS:(CVS)

Neuraxial blockade produces decrease in blood pressure, accompanied by decrease in heart rate.T5-L1 sympathetic fibres determine the vasomotor tone. Blocking these nerves causes vasodilation of venous capacitance vessels and pooling of blood in the viscera and lower extremity, thereby decreasing effective circulating blood volume and venous return to the heart.

Arterial vasodilation decreases systemic vascular resistance. The effect of arterial vasodilation may be minimized by compensatory vasoconstriction above the level of block. A high sympathetic block not only prevents compensatory vasoconstriction, but also block the sympathetic cardio acceleratory fibres that arise at T1-T4.Profound hypotension can result from arterial vasodilation, venous pooling and bradycaria. Unopposed vagal tone explains the sudden cardiac arrest seen with spinal anaesthesia.

PULMONARY MANIFESTATIONS

Alteration in Pulmonary physiology is minimal with neuraxial blockade because the Phrenic nerve is innervated by fibres from C3-C5.

Tidal volume is unchanged. There can be a mild decrease in Vital capacity, which results from a loss of the abdominal muscle contribution to forced expiration. Patients with severe respiratory disease depent on accessory muscle of respiration to actively inspire and expire. High neuraxial blockade in these patients may impair effective coughing and clearing of secretions. Hence neuraxial blocks should be used with caution in patients with respiratory reserve.

GASTROINTESTINAL MANIFESTATIONS

Sympathetic outflow originates at T5-S1. Neuraxial block-induced sympathectomy allows vagal tone predominance and results in a small contracted gut with active peristalsis. This improves operative conditions.

Postoperative epidural analgesia hastens the return of gastrointestinal function after open abdominal procedures.

Hepatic will decrease with reduction in mean arterial pressure.

URINARY TRACT MANIFESTATIONS

There is little effect on renal function as the autoregulation maintains renal blood flow. Neuraxial blockade at the lumbar and sacral segments blocks both sympathetic and parasympathetic control of bladder function. Loss of autonomic bladder control results in urinary retention until the block wears off.

METABOLIC AND ENDOCRINE MANIFESTATIONS

In addition to local inflammatory response produced by surgical trauma, systemic neuroendocrine response occurs via activation of somatic and visceral afferent nerve fibres. This response includes increased concentration of adrenocorticotropic harmone, cortisol, epinephrine, norepinephrine and vasopressin levels. Activation of Renin-Aldosterone-Angiotensin system also occurs. Neuraxial blockade can partially suppress or totally block the neuroendocrine stress response. To maximize this blunting effect, Neuraxial blockade should preceed incision and continue into the postoperative period.

INDICATIONS

- Lower abdominal surgery
- Inguinal surgery
- Urogenital procedures
- Rectal surgery/Lower extremity surgery.

CONTRAINDICATIONS

ABSOLUTE

- Raised intracranial pressure
- Coagulopathy/blood dyscrasias
- Skin sepsis
- Severe mitral stenosis/aortic stenosis
- Patients refusal
- Hypovolemia

RELATIVE

- Preexisting neurological deficits
- Severe spinal deformity

TECHNIQUE OF SPINAL ANAESTHESIA

To perform spinal anaesthesia, the technique is divided into four steps.

- Preparation
- Position
- Projection
- Puncture

PREPARATION

Preparation of the equipment and drugs is essential for subarachnoid injection. The drug chosed should match the duration of surgery and the level of blockade needed for the procedure.

POSITION

The three primary position includes

i. The lateral decubitus position

ii. Sitting position

iii. Prone position

LATERAL DECUBITUS POSITION

It is the most commonly used position. It allows easier administration of sedation and less dependent on a assistant for positioning. Patients are placed with their back parallel to the edge of the operating table nearest the anaesthesiologist, their thighs flexed on their abdomen and their neck flexed to allow the forehead to be as close as possible to the knees.

SITTING POSITION

This position is ideal in two situations.

a. Low lumbar and sacral levels of sensory anaesthesia are required for the Perineal or Urological procedures.

b. Obesity or Scoliosis making identification of midline difficult in the lateral position.

When placing the patient in this position, a stool can be provided as a footrest and a pillow placed in the lap. The assistant then maintains the patient in a vertical plane while flexing the patients neck and arm over the pillow to open up the lumbar vertebral space. The assistant prevents the patient from slumping laterally

PRONE POSITION

This position is appropriate for Rectal, Perineal and lumbar procedures using hypobaric technique. After the patient in position, Lumbar lardosis should be minimized and a paramedian approach used. The anaesthesiologist may have to aspirate for CSF because CSF pressure is minimized when inserting spinal needle in this position.

PROJECTION AND PUNCTURE

After proper preparation and patient positioning ,the midline or the paramedian spinal puncture can be performed.

The midline approach relies on the ability of the assistant to minimize lumbar lardosis and allow easy access to the subarachnoid space between adjacent spinous process, usually L2-L3,L3-L4 or L4-L5.It is the technique of choice because it requires anatomic projection in only two planes and provides a relatively avascular plane.

The paramedian approach is choosed when there is a difficulty in needle insertion with midline approach.The needle is inserted 1cm cauded and lateral to the cauded edge of the cephalad spinous process.

TAYLORS APPROACH

This is a variation of paramedian approach.It is carried out at the L5-S1 space.The needle is inserted in a cephalomedial direction ,1cm medial and cauded to the lowermost prominence of the posterior superior iliac spine.

STOUT'S PRINCIPLE FOR SPREAD OF SOLUTIONS:

1. Height of anaesthesia varies directly with concentration
2. Extent of anaesthesia is inversely proportional to rapidity of fixation
3. Extent of anaesthesia is directly proportional to the speed of injection.
4. Extent of anaesthesia is directly proportional to the volume of fluid
5. Extent of anaesthesia is inversely proportional to the spinal fluid pressure
6. Extent of anaesthesia is directly proportional to specific gravity for hyperbaric solution
7. With hypobaric or hyperbaric solution extent depends upon on position of patient.

INFLUENCE OF PREGNANCY ON SPINAL ANAESTHETIC SPREAD

Pregnant women in second and third trimester require smaller dose of anaesthetic agent. In 1953, the influence of pregnancy on spinal anaesthetic dose requirement was reported in Pitkins Conduction anaesthesia.

Two principle factors for the decreased anaesthetic dose requirement in pregnant women for SAB are

i. Mechanical factor

ii. Hormonal factor

Compression of Inferior vena cava by gravid uterus causes shunting of blood to the venous plexus in the vertebral column. This decreses the vertebral canal space and CSF volume, Thus given spinal anaesthetic mixture will be more diluted in a small amount of CSF than in the non preganant women.

Hormonal factors for an increased sensitivity of the spinal nerves to local anaesthetic agents in pregnancy are

i. High progesterone level in last trimester

ii. Increased endorphine level

iii. Increased alkalinity of CSF

FATE OF THE INJECTED DRUG:

There is a fall in the concentration immediately after injection of the agent into the subarachnoid space due to four pharmacokinetic processes

i. Dilution and mixing in CSF

ii. Diffusion and distribution to neural tissues

iii. Uptake and fixation by neural tissues

iv. Vascular absorption and elimination through arachnoid villi and directly from capillary bed of parenchyma.

FACTORS AFFECTING SPREAD OF LOCAL ANAESTHETIC AGENTS

1. Patient age
2. Height
3. Patient position
4. Configuration of spine
5. Volume of CSF

6. Site of injection
7. Speed of injection
8. Direction of needle
9. Local anaesthetic agent baricity
10. Local anaesthetic agent dose/volume.

FACTORS NOT AFFECTING CSF SPREAD

1. Patient weight.
2. Patient gender.
3. CSF composition /CSF circulation.

DISADVANTAGES AND COMPLICATIONS

1. Controllability- Continuous technique afford a greater margin of control and flexibility.
2. Circulatory disturbances – hypotension occurs with high spinal especially above T4
3. Not suitable for surgery above diaphragm
4. Respiratory impairment with high spinal level
5. Traumatic spinal puncture

6. Post lumbar puncture sequelae – head ache, cranial nerve disturbances(ocular and auditory), infection(meningitis, epidural abcess).

7. Neurological sequelae following injection

    i. Meningismus

    ii. Adhesive arachnoidits

    iii. Cauda equine syndrome/myelitis.

ADDITION USES OF SPINAL ANAESTHESIA

(i) Paralytic ileus

Nonobstructive ileus has been satisfactorily treated with spinal anaesthesia

(ii) Hyperthyroidism

Spinal anaesthesia to the level of fifth thoracic segment has a beneficial effect upon patients in thyroid crisis and thyrotoxic patients undergoing surgery.

(iii) Pulmonary edema

The rationale of treatment with spinal anaesthesia is that this diminishes venous return to the heart and relieves the cardiac load.

(iv) Diagnostic test

For evaluating hypertensive patients, which patients will have a successful treatment from sympathectomy.

(v) Megacolon

In Hirschsprung disease, spinal anaesthesia has been used to block the predominant action by the sympathetic system which causes dilatation.

(vi) Pain evaluation

Differential spinal blockade may be used to evaluate and differentiate functional chronic interactable pain from pain of somatic or sympathetic origin.

USE OF AN INTRODUCER

The concept of the introducer for performance of spinal puncture in anaesthesia was that of Lincoln Sise. The advantages of the introducer are

i. prevents deflection of spinal needle by tough supra and intraspinous ligament as well as resistant skin.

ii. Enables the introduction of fine gauge spinal needle into the subarachnoid space.

iii. Safeguard against contamination of subarachnoid space and carrying of skin bacteria to the thecal space.

iv. Avoid skin fragmentation entering subarachnoid space and formation of Epithelioma.

The purpose of the introducer is to enable the entry of the spinal needle into the depth of interspace without touching skin, subcutaneous tissue and the stiff supraspinous and interspinous ligament.

TESTING OF THE SPINAL NEEDLE QUALITY

The flexibility and the resiliency of the needle is to be tested. The hub of the needle is grasped with one hand and the shaft of the needle with the other hand.The ends should be depressed gently to make the needle bent.On release of the shaft,the needle should spring back to a straight position,demonstrating the above properties.

The needle with the stylet snugly in position,should be thrust through a sterile gauze square.If there is a poor matching of the stylet with the needle or if a burr is present at the point of the needle,then a thread or two will be caught at the tip.

PHARMACOLOGY OF THE DRUG

PHARMACOLOGY OF THE DRUG

Local anaesthetics are drugs that inhibit sensory,motor or autonomic nerve function when injected or applied near the neural tissue.

These drugs consist of a lipophilic,unsaturated aromatic ring and a hydrophilic,tertiary amine separated by a hydrocarbon chain that includes an ester or amide linkage.These drugs are weak bases,carrying a positive charge at the terminal amine group at physiological pH

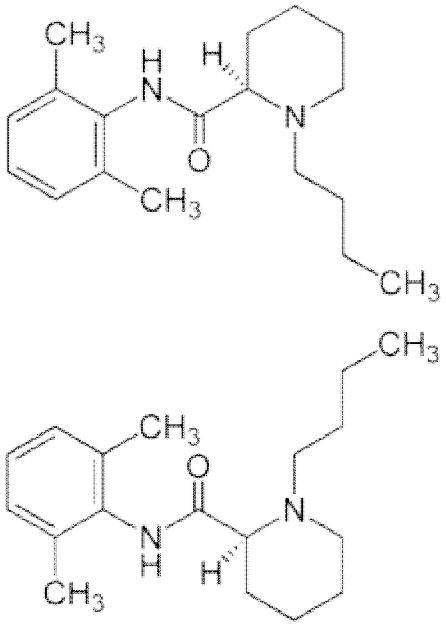
The minimum concentration of local anaesthetic that will block the nerve impulse is affected by

i. Fibre size, type, myelination
ii. pH
iii. frequency of nerve stimulation
iv. electrolyte concentration.

Onset of action depends on lipid solubility,relative concentration of nonionized lipid soluble and ionized water soluble form expressed as pKa.Local anaesthetic with pKa closer to physiological pH will have a greater concentration of nonionized base that permeates the nerve cell membrane rapidly.

BUPIVACAINE

It is a synthetic drug,prepared by A.F.Ekenstam in 1957 and marketed as Marcaine.



- Molecular weight of chloride salt is 325 and that of the base is 288.
- Melting point-258 degree Celsius.
- pH of the solution with adrenaline is about 3.5
- The chemical name is 1-n-butyl-DL-piperidine-2-carboxylic acid-2,6 dimethylanilide hydrochloride

CHEMICAL PROPERTY OF THE DRUG

- The base is sparingly soluble, the hydrochloride is readily soluble in water.
- The drug is stable and can withstand autoclaving.
- It is more potent and long acting than lidocaine.
- Anaesthetic index is 3-4.

PHARMACODYNAMICS

The onset of action is between 5-7minutes,maximum anaesthesia is obtained between 15-25 minutes.

PLASMA BINDING

The drug binds avidly with protein to the extend of 70-90%.

METABOLISM

As its an amide,Liver is the primary site of metabolism mostly by alkylation.10% drug is excreted unexchanged in the urine.The high protein-binding capacity explains the less diffusion of the drug across the placenta

MECHANISM OF ACTION

The drug inhibits passage of sodium ions through ion-selective sodium channel in the nerve membrane.It slows the rate of depolarization so that the threshold potential is not reached and action potential not propagated.

Bupivacaine blocks the sodium chanel in inactivated closed state,and prevent their change to the resting closed and activated open in response to nerve impulse.

The drug also binds to activated open sodium channels to produce frequency dependent blockade.

They also act on voltage dependent potassium channel.Evidence suggest that they can act on G-protein coupled receptor also.

SIDE EFFECTS

The principal side effects are allergic reactions and systemic toxicity due to excessive plasma and tissue concentration of the agent.

ALLERGIC REACTION

The Ester local anaesthetics producing metabolites of para-aminobenzoic acid evoke allergic rection more than Amide local

anaesthetics.Allergic reaction also develop for methylparaben,a preservative in commercial preparation. History of rash,utricaria,laryngeal edema,with or without bronchospasm and hypotension is suggestive of local anaesthetic induced allergic reaction.

SYSTEMIC TOXICITY

Excess plasma concentration due to accidental intravascular injection or absorption from injection site accounts for systemic toxicity.

CARDIOVASCULAR SYSTEM (CVS)

The CVS toxicity is more resistant to treatment than CNS toxicity. During diastole,highly lipid soluble bupivacaine dissociates slowly from sodium ion channel,thus accounting for persistant cardiac toxicity.Ropivacaine is a pure S-enantiomer that is less lipid soluble and less cardiotoxic than bupivacaine.Drug toxicity presents as precipitous hypotension,arrhythmias and atrioventricular blocks.

CENTRAL NERVOUS SYSTEM (CNS)

The CNS toxicity ranges from perioral numbness, seizures, CNS depression, accompanied by hypotension and apnea. Transient neurological symptoms,Cauda Equina syndrome and Anterior spinal artery syndrome are documented complications.

POSTDURAL PUNCTURE HEADACHE

POSTDURAL PUNCTURE HEADACHE

Apart from intentional dural puncture in subarachnoid block,epidural anaesthesia performed for postoperative and labour pain relief can result in unintentional dural puncture.However dural puncture is a commonly performed invasive procedure for diagnostic lumbar puncture,myelography and intrathecal chemotherapy.

12% claims of malpractice filed against anaesthesiologist providing obstetric anaesthesia care were because of postdelivery headache in patients who received epidural anaesthesia and probable dural puncture.

CHARECTERISTICS OF PDPH

PDPH is

- dull aching or throbbing in nature.
- occurs within 7 days of dural puncture.
- It is self-limiting and disappears within 14 days.
- It worsens in upright position and eases when supine.
- Headache is often in occipital region.
- Pressure over the abdomen with the women in upright position may give transient relief to headache by increasing the intracranial

pressure secondary to the increase in intraabdominal pressure.(GUTSCHE SIGN)

CAUSES OF POSTPARTUM HEADACHE

After delivery, 39% of Parturients report symptoms of headache unrelated to dural puncture. There are many causes that mimics PDPH in postoperative period that need to be diagnosed as the treatment modalities varies.Causes include

(i) Infective

Meningitis and encephalitis

(ii) Vascular causes

Migraine

Cerebral vein thrombosis

Cerebral infarct

Subdural hematoma

Subarachnoid hemorrhage

(iii) Neoplastic

Space occupying lesion

(iv) Pharmacological or metabolic

Dehydration / Caffeine withdrawal

(v) Others

Postdural puncture headache

Pre-eclampsia

Tension headache

Benign intracranial hypertension

Pneumocephalus

Lactational headache.

PATHOPHYSIOLOGY OF PDPH

With dural puncture, there is loss of CSF and lowering of CSF pressure.Rate of CSF loss is greater than the rate of CSF production particularly with spinal needle size greater than 25 gauge.

Possible explanation for headache includes

i. Lowering of CSF pressure causes traction on pain sensitive intracranial structures like meninges,vessels and cranial nerves leading to headache.

ii. According to Monro-Kellie Hypothesis,loss of CSF volume is compensated by venodilatation resulting in increased blood volume.

INCIDENCE:

In 1898,the incidence of PDPH was as high as 66% due to larger gauge, medium bevel, cutting spinal needles.

Needle design	Gauge	Incidence
Quincke	22	36%
	25	3-25%
	26	0.3-20%
	27	1.5-5.6%
	29	0-2%
Whitacre	20	2-5%
	22	0.6-4%
	25	0-14.5%
	27	0%
Sprotte	24	0-9.6 %
Atraucan	26	2.5-4 %

The incidence of PDPH is directly proportional to the gauge of the needle and inversely proportional to the experience of the

anaesthetist. The incidence is less if the bevel of the needle is oriented parallel to the direction of dural fibres. The loss of resistance with air increases the risk of PDPH than loss of resistance with saline during epidural anaesthesia.

RISK FACTORS

The risk factors for the development of PDPH may be either needle related or patient related.

The needle related factors are

i. size of the needle.

ii. shape of the needle tip.

Larger the gauge, more is the incidence of PDPH. Fine gauge spinal needles have a low incidence of PDPH but are technically more difficult to use with high failure rate. Pencil tipped non-cutting needle tips are associated with low incidence of PDPH than cutting needle tip.

Patient related factors are

- Age./
- Sex.
- Body mass index.
- Obstetric population.

PDPH is more common in young age group. In children, incidence is less because of low reporting rate and low CSF pressure. In old age, incidence is less because of the following reasons

- Decreased elasticity of dural fibres
- Decreased reactivity of cerebral vessels
- Decreased A delta and C fibres
- Attenuated central sensititation.
- Elevated pain threshold.

PDPH is more common in Women.In a series report by Vandane and Dripps,women have twice the incidence as in male.It was found to be 12% in women and 7% in men. It is stated that the greater incidence is because of the larger number of obstetric patients in women group.

PDPH is more common in low BMI patients.

Obstetric patients are at high risk because of their sex,young age and the frequency of epidural anaesthesia as a part of labour analgesia.

SYMPTOMS

- Postural headache.
- Neckache
- Nausea.
- Vomiting.
- Tinnitus.
- Blurring of vision.
- Hearing loss.
- Vertigo.
- Dizziness
- Paresthesia of the scalp, lower and upper limb pain.

DIAGNOSIS

There is a positive history of accidental or deliberate dural puncture.

Diagnosic LP demonstrates low CSF pressure or a dry tap,a slight increase in CSF protein and increase in CSF lymphocyte count.

MRI shows diffuse dural enhancement with evidence of dural sagging,descent of brain,optic chiasma and brain stem,obliteration of basal cisterns and enlargement of pituitary.

CT myelogram, Retrograde Radionuclide Myelography, Cisternography can locate the site of dural leak.

ESTIMATED RATE OF SPONTANEOUS RECOVERY

DURATION	% RECOVERY
1-2 days	27
3-4days	39
5-7days	19
8-14 days	8
3-6weeks	5
3-6months	2
7-12months	4

The largest follow-up of PDPH is still that of Vandam and Dripps et al in 1956.They reported that 72% headache resolved within 7 days and 87% within 6 months.

TREATMENT

1. Adequate hydration is to be maintained.Studies have been done to know effect of preloading with PDPH and found that Preloading cannot prevent PDPH.Its better to maintain adequate hydration than dehydration.

2. Most of the patients respond to simple analgesics like NSAIDS,Acetaminophen.

3. Supportive treatment like antiemetics can be given.

4. Prone posture increases intraabdominal pressure and epidural pressure.A clinical trial of prone position following dural puncture failed to demonstrate any decrease in PDPH.

5. Pharmacological treatment includes
    i. Caffeine
    ii. Cosyntropin(ACTH analogue)
    iii. Sumatriptin(5HT1D Receptor agonist)

(i) CAFFEINE

It is a CNS stimulant,produces cerebral vasoconstriction,blocks peripheral adenosine receptors and other central mechanisms.It is given as Caffeine sodium benzoate orally or intravenously.Dose is 500mg orally or 500mg in one litre intravenous fluid iv over one hour.

The most frequently quoted work on treatment of PDPH with caffeine is that of Sechzer. He concluded that iv caffeine is an effective treatment for PDPH.

The side effects of caffeine are

- CNS Stimulation.
- Seizures.
- Gastric irritation.
- Cardiac arrhythmias.

Treatment with caffeine does not decrease CSF leak nor restores normal CSF dynamics,therefore the recurrence rate is 60%.

(ii) COSYNTROPIN

It is an ACTH analogue, less antigenic than naturally occurring harmone. It stimulates adrenal cortex to secret glucocorticoids, mineralocorticoids and weak androgens. It activates adenyl cyclase, with

resultant increase in intracellular cyclic AMP. Increased CSF production through a sodium active transport mechanism, as well as possible increase in beta endorphin in CNS, increased pain threshold are the possible mechanism of action.

Dose is 0.25-0.75mg intravenous.

(iii) SUMATRIPTAN

It is a 5HT1D receptor agonist. Carp et al reported administration of sumatripten 6mg to six patients with headache within six hours and reported good results.

EPIDURAL BLOOD PATCH

Introduced by Gormley in 1960.usually performed for severe headache not responding to conservative management after 24 hours.

Contraindication includes

- Fever
- Coagulopathy
- Infection at the site
- Patients refusal.

Blood samples to be sent for microbiology for culture before proceeding for the procedure. Patient is placed in lateral position,epidural space identified with tuohy needle at the level of supposed dural puncture or one space below. Two persons are required to perform the technique. One person identifies Epidural space while the other draws 10-20 ml of blood under aseptic precaution. Withdrawn blood is injected into the epidural space at the rate of one ml every three seconds. The injected blood clots and seals the dural rent and the compressed dural space restores the subarachnoid pressure. The injection should stop if the patient experiences lancinating pain or backache. The patient should lie flat on the back for one or two hours, then allowed to walk.

Complication of this invasive technique is that of

- Backache
- Infection,arachnoiditis
- Failure of treatment.

EPIDURAL SALINE/DEXTRAN

Saline is relatively inert and sterile. It can be given as bolus or infusions. Some of the recommendations are

- 1 to 1.5 litres of epidural hartmann solutions over 24hours,starting on day 1 after spinal anaesthesia.
- Upto 35ml/hr for 24 hours on development of headache.
- Single 30ml epidural bolus after development of headache.
- 10-120ml of saline injected as bolus via caudal epidural space.

EPIDURAL,INTRATHECAL,PARENTERAL OPOIDS

Majority of the studies on use of morphine is either case reports or inadequate controlled trials.

FIBRIN GLUE

Fibrin glue is a preparation of pooled human plasma obtained from plasmapheresis. It is prepared by mixing two solutions. First one contains fibrinogen, factor VIII, fibronectin ,aprotinin, plasminogen. The second one contains thrombin and calcium. The mixture forms a gel with high tensile strength. It is applied blindly or CT- guided percutaneous injection. Complication includes risk of Aseptic meningitis.

INTRATHECAL CATHETERS

The placement of spinal catheters through the perforation may provoke an inflammatory reaction that will seal the hole.Complication include risk of Cauda equina syndrome and infections.

NUMBER OF ATTEMPTS

Lybecker et al didn't support a association between frequency of PDPH and the number of dural puncture.But recent prospective analysis of SAB performed on 8034 patients showed increased incidence of PDPH with repeated attempts.

FAILED SPINAL ANAESTHESIA

Though spinal anaesthesia is safe,cost effective and reliable technique commonly used,failed spinal block is a possibility if the technique is not performed meticulously.Inadequate/failed spinal anaesthesia is very difficult to manage.

Two factors are very important determinant of a successful blockade.They are

i. Dural puncture
ii. Deposition of the drug in correct dose into the thecal space.

Spinal anaesthesia is technically easy procedure with a clear cut end point,the CSF.The appearance of CSF at the needle hub gives us an indication that we are in the thecal space.At the same time,appearance of CSF alone doesn't guarantee successful blockade.

Failed block can be of three types, namely

i. Inability to get a flow of CSF,called as Dry tap.

ii. subarachnoid block attempted,no resultant block.

iii. Block ensues,but inadequate for the extend and qualityof anaesthesia and duration of surgery.

Failure of spinal anaesthesia is avoidable provided the technique is performed properly. With experienced hands,incidence of failed spinal is less than 1%

There are five phases of spinal anaesthesia which can influence the failure incidence. They are

i. Lumbar puncture
ii. Injection of the drug
iii. Spread of the drug
iv. Action of the drug
v. subsequent patient management.

LUMBAR PUNCTURE

The problems encountered during lumbar puncture are due to two factors,

- poor positioning of the patient
- incorrect needle insertion

Abnormalities of the spine like kyphoscoliosis and calcification of the ligaments, obesity, patients anxiety plays a role in poor positioning of the patient.

The spinal needle is inserted in midline, midway between the posterior spines.The shaft of the needle is placed at right angle to the back of the patient.When there is resistance to insertion,the needle is angulated in cephalad direction.While advancing the needle,a mental picture of the spinal anatomy helps to appreciate where the needle tip lies.

INJECTION OF THE DRUG

The drug should be injected into the thecal space for a successful blockade.Anterior or posterior displacement of the spinal needle while attaching the syringe to the needle or while injecting the drug can result in an inadequate block or failed spinal.With pencil tip needles,the opening is proximal to the tip.Slight backward movement can result in

loss of drug injected into the epidural space and a forward movement can elicit parasthesia by the tip contacting the nerve fibres.

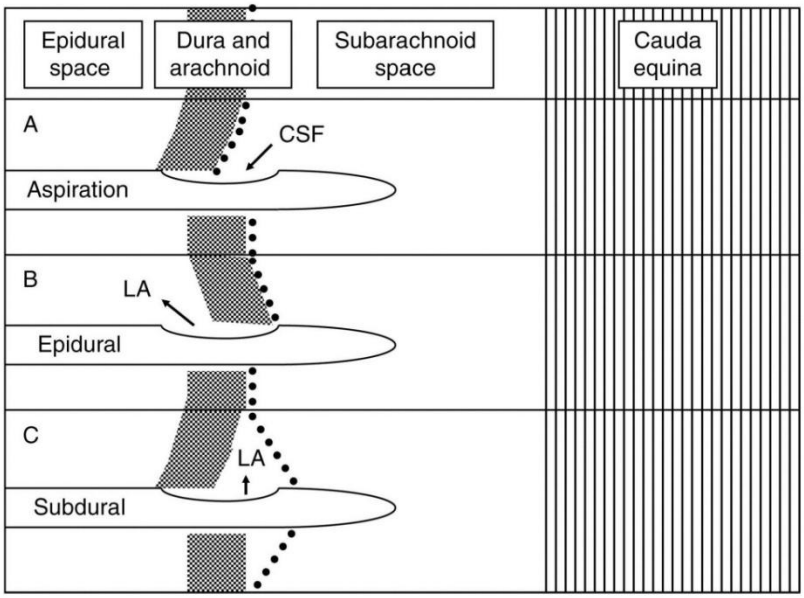
SPREAD OF THE DRUG

The CSF acts as a medium through which the drug acts.The spread of the drug is dependent on the baricity of the drug injected,position of the operating table and the anatomical abnormality of the vertebral canal.

PATIENT FACTOR

Surgical stimulus can stimulate the unblocked parasympathetic and phrenic nerve ,making the patient anxious.The patients should be explained the technique to be performed and what to expect before proceeding to surgery.

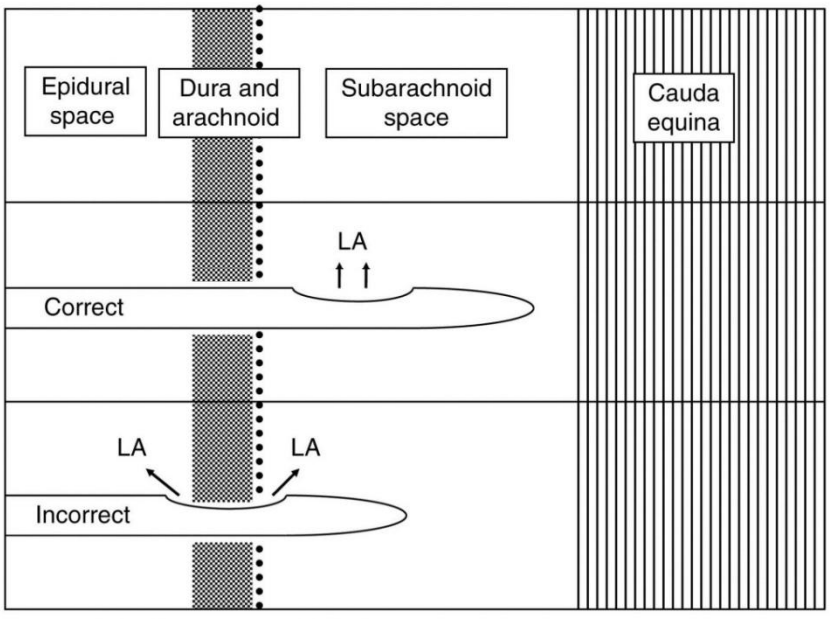
To show how the dura or arachnoid mater may act as a 'flap' valve across the opening of a pencil point needle.



Fettes P D W et al. Br. J. Anaesth. 2009;102:739-748

Figure 7 & 8 :- Position of the Needle Tip

Possible positions of the tip of a pencil-point needle.



Fettes P D W et al. Br. J. Anaesth. 2009;102:739-748

REVIEW OF LITERATURE

REVIEW OF LITERATURE

HISTORY OF SPINAL ANAESTHESIA

In 1885,Leonard Corning,a Newyork Physician,accidentally injected cocaine intrathecally in a dog.He proposed that local anaesthesia of the spinal cord with cocaine may have therapeutic property.He injected cocaine in a man at the level of T11-T12 interspace to treat seminal incontinence.He coined the term SPINAL ANAESTHESIA.

In 1891,Wynter and Quincke aspirated CSF from subarachnoid space to treat increased ICT associated with TB meningitis.

In 1898,Karl August Bier,a german surgeon and his assistant Hildebrandt underwent spinal anaesthesia with cocaine,the assistant first injecting Bier and then Bier his assistant.While injecting the assistant struggled to connect the syringe to the needle,resulting in significant loss of CSF.He developed severe headache and he correctly noted that the headache was related to the loss of CSF.

In 1901,a swiss obstetrician used intrathecal cocaine for pain relif in second stage of labour.Though high incidence of both vomiting and PDPH noted,a high mortality rate in LSCS performed under subarachnoid block led to abandon the technique in 1930.The period from 1930-1950 is

referred to as Dark Age Of Obsteric Anaesthesia,when natural child birth and psychoprophylaxis were encouraged.

Development of fine gauge spinal needles and needle tip modification has enabled a significant reduction in the incidence of PDPH.

HISTORY OF SPINAL NEEDLES

The development of spinal needles and needle tip modification began with the understanding of anatomy and physiology of CNS that pertained at the time of introduction of spinal anaesthesia.

In 1841,Zophar jayne of illinos designed a syringe attached to a small sharp,hollow beak with an opening on the side near the tip.

In 1853,Alexander Wood of Edinburg is credited the first in developing hollow hypodermic needle. He used Fergusons needle for injecting into deeper structure.

In 1885,Leonard Corning developed his own needle made of gold or platinum. cannula was flexible with a metal stop and a set of screw to fix the needle at correct place once the subarachnoid space has been entered. Tip is sharp,short cutting bevel.Introducer was short with a right angled handle.

Figure 9 : Corning Needle

Bier took a historic step of using spinal anaesthesia to provide analgesia for surgical procedure. He designed a large bore needle,15gauge or 17gauge that needed no introducer. It has a long cutting bevel and a sharp tip. Biers needle was criticized for causing pain on injection and leaving a large hole in dura.

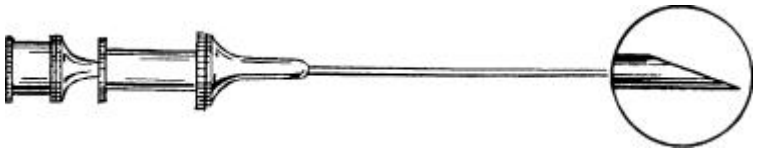


Figure 10 : Bier's Needle

Bainbridge in 1900,described a needle with a small circular hub,a short sharp cutting bevel and a stylet with a matching bevel,made of flexible metal.

Barker appreciated the problem with long bevel and he designed a hollowed out point to secure sharpness without lengthening the terminal opening.Barkers needle is 18 gauge or 19 gauge with a medium length bevel and a stylet with a matching bevel.

In 1914,Babcock described a sharp,medium length bevel with the matching stylet,made of iridized pplatinum or gold.It was 20 gauge in diameter and referred as Quincke babcock needle.It was a very successful needle and became the standard needle for comparative studies.

Figure 11 : Quincke Babcock Needle

Gaston labot needle was a medium gauge cannula with a short,sharp bevel and a matching stylet. The tip ground to match the bevel of the cannula.

ATRAUMATIC SPINAL NEEDLE TIPS

In 1920,realization of the fact that CSF leak is associated with cutting of duramater led to the development of needle tip modifications.

In 1923,Hebert Morton Greene used an ordinary 23 gauge cutting needle that he shaped to a rounded tip by removing the cutting edge of the bevel.The needle was sized between 20gauge and 26 gauge.The point was a rounded,non-cutting bevel of medium length with a matching,bevelled fitted stylet.It was very popular in obstetric practice till the invent of Whitacre needle in 1951.

MODIFICATION OF CUTTING BEVEL

Pitkin needle is 20gauge or 22 gauge,made of relatively flexible rustproof steel with a collar to mark the depth of insertion.Tip has short,sharp bevel ground off to a taper of 45 degrees,resulting in rounded blunted bevel heel.He advocated the insertion of cutting edge of the bevel parallel to the longitudinal fibres of dura.

PENCIL POINT NEEDLES

Barker was credited the first directional closed-end spinal needle,which forms the basis of pencil-point tip used commonly nowadays.

Hart and Whitacre designed a closed ended,lateral orifice,pencil point tip needle in 1951.It is a 20 gauge needle with a solid end drawn to a point similar in shape toa finely sharpened pencil.These needles have decreased incidence and severity of PDPH and a more appreciable dural click.The needle has a small hole making aspiration and injection difficult.

Figure 12 : Whitacre Needle

CONTINOUS SPINAL NEEDLE

Various spinal needle were described in literature.

- Lemmon needle
- Hingson Fegurson needle
- Tuohy needle
- Cappe and Deutsch needle.

SPROTTE NEEDLE

It is a modification of Whitacre needle. It has increased size of lateral orifice to combat the problem of slow CSF flow and resistance to injection. The tip is also elongated in an attempt to allow more gradual separation of dura.

Figure 13 : Sprotte Needle

ATRAUCAN NEEDLE

In 1993,Atraucan needle has a cutting double bevel with a sharp point making an initial incision. The second part then dilates the incision rather than cutting leaving a small hole in the dura.

DOUBLE HOLE PENCIL-POINT NEEDLE

Eldor in 1996 was based on pencil point tip but with two lateral holes opposite to each other.

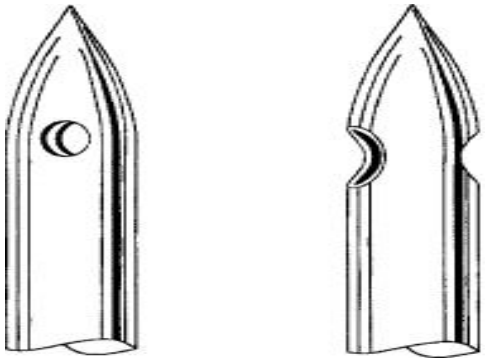


Figure 14 : Eldor Needle

BALLPEN NEEDLE

It's a modification of Quincke needle designed in 2000.This needle is similar to Levy needle of 1957.Advantages of the needle are

i. tip of the needle is always in the subarachnoid space on removal of stylet

ii. needle tip doesn't project beyond the orifice to cause neurological damage

iii. no mechanical weakning at the tip caused by the presence of lateral opening.

Figure 15 : Ball Pen Needle

Shutt Le et al in 1992,compared the incidence of PDPH in 150 obstetric patients using 26gauge Quincke,22gauge Whitacre and 25 gauge Whitacre needles.The problem with the study was that the power of study was not disscussed.Power of study estimated by Altmans nomogram is 0.55 which is too low to expect a significant result.They stated difference in the incidence of headache was statistically insignificant.The incidence of PDPH was 4% with Quincke needle and 1% with Whitacre needle.(Br.J.Anaesth;1992,69:589-94)

A study includes 300 patients posted for lower limb/ortho surgery.They were allotted into 3 groups.Group 1 had SAB with 25 gauge Quincke needle, with bevel oriented perpendicular to the fibres.Group 2 had SAB with 25 gauge Quincke, with bevel oriented parallel to the dural

fibres.Group 3 had SAB with 24 gauge Sprotte.The incidence of PDPH was 17.9%,4.5% and 2.4% respectively.The results shows that Quincke needle should not be inserted perpendicular to the dural fibres and tha Sprotte needle does not solve the problem of PDPH or backache.(Reg.Anaesth 1992;17(5):283-7)

A study comparing 24 gauge Sprotte and 25 gauge Quincke spinal needle showed lower incidence of severe PDPH with 24 gauge Sprotte but was not significantly different when compared with 25 gauge Quincke spinal needle.In this study,194 patients were allotted into group 1(n-96,Sprotte) and group 2(n-98,Quincke).Fentanyl was given intrathecally in 47 patients in group 1 and 49 patients in group 2.All patients followed for 4 days postoperatively for headache.Incidence of PDPH was found to be 4.2% in Sprotte group and 7.1% in Quincke group.(Reg Anaesth 1993;18:222-5)

Campbell et al in 1993,studied in 300 patients with 24 gauge Sprotte and 25 gauge Whitacre needle.Each group includes 150 patients.The incidence of PDPH is 4% with sprotte needle(6/150) and 0.66% with whitacre needle(1/150).(Can.J.Anaesth 1993;40(12):1131-5)

A study of 400 patients, comparing 25 gauge Whitacre and 25 gauge Quincke spinal needles showed 3%($p<0.02$) incidence with

Whitacre and 8.5% with Quincke needle.No significant difference in age or sex in both groups.The duration lasted for 1-3 days in Whitacre group and 1-9 days in Quincke group.(Reg Anaes.1993;18:166-9)

The frequency and severity of headache after Lumbar myelography using 25 gauge Whitacre in 63 patients aged 20-81 years showed an incidence of 4.7%.3 patients had PDPH.(Neuro radiology 1995;37:553-6)

Incidence of PDPH was 4% with 26 gauge Atraucan and 4.3% with 25 gauge Whitacre spinal needle in a study.Use of 26 gauge helps in better identification of subarachnoid space,faster CSF back flow and fewer parasthesia.(Can J Anaesth 1995;42:706-10)

Lambert et al reported the rate of PDPH with 25gauge Whitacre as 1.2%, 2.7% with 27gauge Quincke cutting needle and 5.2% with 26 gauge Quincke needle. He included 4125 patients over 4 years period.(Reg.Anesth 1997;22(1):66-72)

In Acta Anaesthesiology Scand 1997;41:779-84,200 patients posted for day care procedure were studied for the severity and incidence of PDPH in using 27 gauge Quincke and 27 gauge Whitacre.Incidence of PDPH is 0% with 27 gauge Whitacre spinal needle and 5.6% with 27 gauge Quincke needle.All PDPH occurred with Quincke needle oriented perpendicular to the duramater.

Hwang JJ,HOST et al in 1995,studied 90 patients with 26 gauge Quincke and 25 gauge Whitacre needle.Incidence of PDPH was 6.66% with Quincke and 1.52% with Whitacre.

Jost u et al in 2000,studied 600 patients using 26 gauge Quincke and 27 gauge Whitacre. Incidence of PDPH was 6% with Quincke and 1% with Whitacre. (Anasthesiol Intensive Med;2000,35:381-7)

Vallejo et al studied the incidence of PDPH and Epidural Blood Patch using 5 spinal needles in obstetrics.He used 2 cutting needle(26 gauge atraucan and 25 gauge Quincke) and 3 pencil point needles(24 gauge Gertie Marx,24 gauge Sprotte,25 gauge Whitacre).The incidence of PDPH and EBP are 5%, 8.7%, 4%, 2.8%, 3.1% and 55%, 66%, 12.5%, 0%, 0% respectively. (Anaesthesia and Analgesia 2000;91-4:916-920)

Invitro study of the dural lesion evaluated by scanning electron microscopy was done while using 25 gauge Quincke and 25 gauge Whitacre.T11-L4 dural membrane from 5 fresh male patients declared brain dead,aged 23,46,48,55 and 60 were excised by anterior laminectomy.100 punctures (20 on each samples) at 90 degrees made.50 with 25 gauge Quincke and Whitacre each. It is shown that the dural hole is clean cut with Quincke and lacerated with Whitacre needle.This

accounts for more inflammation seen with Whitacre needle and therefore better healing.(Reg Anaesth Pain Med 2000;25:393-402)

Landau R et al in 2001,studied 400 patients with 25 gauge Whitacre and 27 gauge Whitacre needle.The incidence of PDPH was 1.32% with 25gauge and 0.03% with 27gauge Whitacre needle.(Int.J.Obstet Anaesth;2001,10:168-71)

75 female patients scheduled for LSCS were grouped into 3 of 25 each.Group 1,2,3 received SAB using 25 gauge Quincke,27 gauge Quincke and 27 gauge Whitacre needles respectively.The patients were assessed for the severity of PDPH and the technical difficulties with the needle insertion.All the patient had mild form of PDPH.25 gauge needle had 100% successful dural puncture and 27 gauge Whitacre had 12% failure rate.(Indian J.Anaesth 2002;46(5):373-377)

Tabedar in 2006,studied 60 patients with 25 gauge Quincke and 26gauge Whitacre needle. Incidence was 8% with Quincke and 2.2% with Whitacre. (Kathmandu Uni. Med.J;2003,1:263-6)

Bano F et al in 2004,studied 100 patients with 25 gauge Quincke and 25gauge Whitacre.The incidence of PDPH was 4% with Quincke and 0.75% with whitacre.(Dow University of Health science hospital,Karachi;2004,14:647-50)

In a study 480 obstetric patients were included as group 1-(25 gauge Quincke,n-168),group 2(27 gauge Quincke,n-160)and group 3(27 gauge Whitacre,n-152). The study comparing 25 gauge Quincke,27 gauge Quincke and 27 gauge Whitacre needle showed the incidence of PDPH as 8.3%(14/168) with 25 gauge Quincke,3.8%(6/160) with 27 gauge Quincke,2%(3/152) with 27 gauge Whitacre needle.The severity of PDPH was mild in 5,moderate in 7 and severe in 2 patients in group 1.In group 2,it was mild in 2,moderate in 3 and severe in 1 patient.In group 3,2 patients had mild headache and 1 patient had moderate headache.(Med Coll Abottabad 2008;20:10-3)

MATERIALS AND METHODS

MATERIALS AND METHODS

The study is to compare the incidence and severity of PDPH,number of attempts for successful block and number of failed spinal in using 25 gauge Quincke and 25 gauge Whitacre spinal needles in 240 obstetric patients after getting approval by the Institutional Ethical Committee.It is a double blind study where the patient is unaware of the needle type used and the postoperative assessment of headache is done by a person unaware of the needle type used.

The study was done in the Department Of Anaesthesiology,Institute of Social Obstetrics,Government Kasthurba Gandhi Hospital for Child and Women,Triplicane,Chennai-5.

240 obstetric patients posted for elective LSCS under Subarachnoid block were randomly allocated into group A and group B by using a computer generated randomization table .

SELECTION CRITERIA

INCLUSION CRITERIA

- Age 20 to 36 years.
- Weight 58 to 87 kilograms.
- Height 148 to 170 cms.
- ASA 1 ,2

- Elective surgery
- Valid informed consent.

EXCLUSION CRITERIA

- Not satisfying inclusion criteria
- Lack of Written informed consent.
- Contraindication for neuraxial anaesthesia.
- H/O Recurrent headache in the past.
- H/O Occipital neuralgia/Migraine.

PROCEDURE

PREOPERATIVE EVALUATION

A thorough history taking and clinical evaluation done to include patients who satisfy inclusion and exclusion criteria.Preoperative investigations done as all cases posted for elective surgery.All patients were briefed about the nature of the study,procedure to be performed and a valid written informed consent obtained.

The patients were instructed fasting from midnight, atleast for 8 hours.

The patients transported to the operation theatre in left lateral position.Monitors of pulseoximeter,electrocardiogram(ECG) and non-

invasive blood pressure(NIBP) attached before performing subarachnoid block and monitored throught out the procedure.An intravenous access established over the dorsum of left hand with 18 gauge venflon.Preloading with 20ml/kg of Ringer lactate done for all patients.Premedication with injection Ranitidine and injection metaclopramide given one hour prior to surgery.

240 patients were randomly allocated into group A and group B.

Group A patients received subarachnoid block with 25 gauge Whitacre needle and Group B received SAB with 25 gauge Quincke needle.

After preloading,patients were placed in right lateral position.The back of the patient was cleaned with Povidone iodine and spirit and draped with sterile towel.A skin wheel was raised with 2ml of 2% Lignocaine and SAB performed with 10mgs of 0.5% hyperbaric bupivacaine at L3-L4 space.The patient was turned supine after giving the drug,with a wedge under the right hip.

Anaesthesia considered adequate when the sensation to cold is lost at the level of T4,tested with alcohol.Oxygen administered with Hudsons mask at 4litres/min throught the procedure.Mean blood pressure monitored every five minutes intervals and any decrease more 20% from

baseline was treated with a 100ml bolus of crystalloids and incremental bolus of 6mgs intravenous Ephedrin.

10units Syntocinon administered as intramuscularly and as intravenous infusion after the delivery of the baby.

In case of failure of SAB or inadequate analgesia,patients were administered General anaesthesia.Failure of block is defined as either an inability to produce a free flow of CSF after three attempts or inadequate analgesia for surgery at 15 minutes after giving the local anaesthetic agent.

The number of attempts required for successful blockade was also noted for both the type of needles.

Postoperatively all the patients were enquired about the onset,charecteristics,duration,severity and associated symptoms of any headache for three days.PDPH is charecterised by postural headache,aggrevated by sitting or standing and relieved by lying supine.It may be dull aching or throbbing,mostly in the occipital or frontal region,accompanied by nausea,vomiting,neck stiffness,diplopia and tinnitus.

The patients with features suggestive of PDPH were treated with iv fluids,bed rest and oral paracetamol 15mgs/kg ,four times daily.

The severity of headache was categorized as follows

- Mild PDPH

Slight restriction of physical activity,these patients are not restricted to bed and had no associated symptoms.

- Moderate PDPH

The patient is forced to stay in the bed for part of the day, resulting in restricted physical activity, not necessarily associated with symptoms.

- Severe PDPH

The patients were bedridden for most of the day, associated symptoms always present.

STATISTICAL ANALYSIS

Descriptive statistics was done for all data and suitable statistical tests of comparision were done.Unpaired t-test was used for continuous variable and Chi-square Test and Fischer Exact test were used for categorical variables analysis.

RESULTS

OBSERVATION AND RESULTS

Treatment Groups	Name of Group	Treatment	Number of Subjects
Group A	25 GW	PDPH using pencil-point 25G Whitacre spinal needle in obstetric patients	120
Group B	25 GQ	PDPH usingCutting bevelled 25 G quincke spinal needle in obstetric patients	120

Statistics

Descriptive statistics was done for all data and suitable statistical tests of comparison were done. Continuous variables were analysed with the unpaired t-test and categorical variables were analysed with the Chi-Square Test and Fisher Exact Test. Statistical significance was taken as $P < 0.05$. The data was analysed using EpiInfo software (7.1.0.6 version; Center for disease control, USA) and Microsoft Excel 2010.

Sample Size Calculation

Sample size was determined on the basis of a pilot study in which the incidence of Post Dural Puncture Headachewas measured as 18%. We calculated a minimum sample size of 113 patients was required in each group, assuming a type 1 error (two-tailed) of 0.05 and a margin of error of 5%. Therefore, the final sample selected was n=120 in Group A and n=120 in Group B.

$$n = \frac{t^2 \times p(1-p)}{m^2}$$

Description:

n = required sample size

t = confidence level at 95% (standard value of 1.96)

p = estimated prevalence of malnutrition in the project area

m = margin of error at 5% (standard value of 0.05)

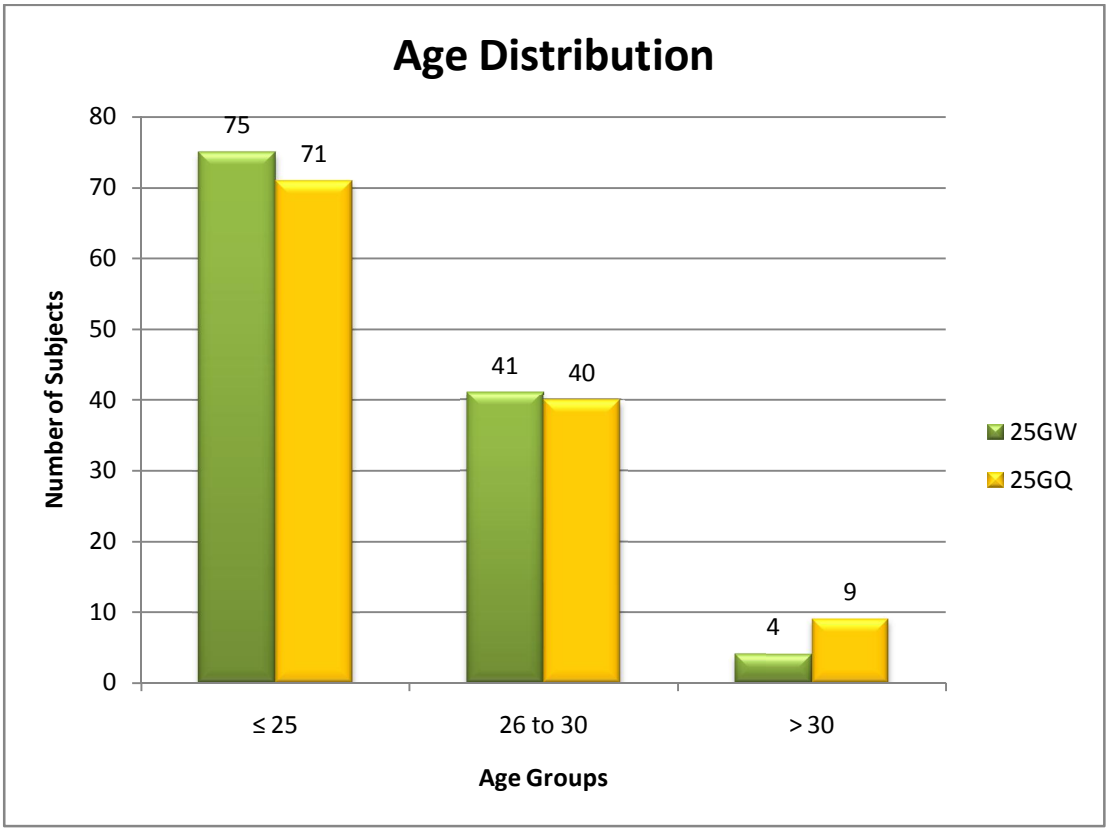
$$n = \frac{(1.96)^2 \times 0.18(1-0.82)}{(0.05)^2}$$

$$n = \frac{3.8146 \times 0.1476}{0.0025}$$

$$= 226$$

$$= 113 \text{ per group}$$

AGE

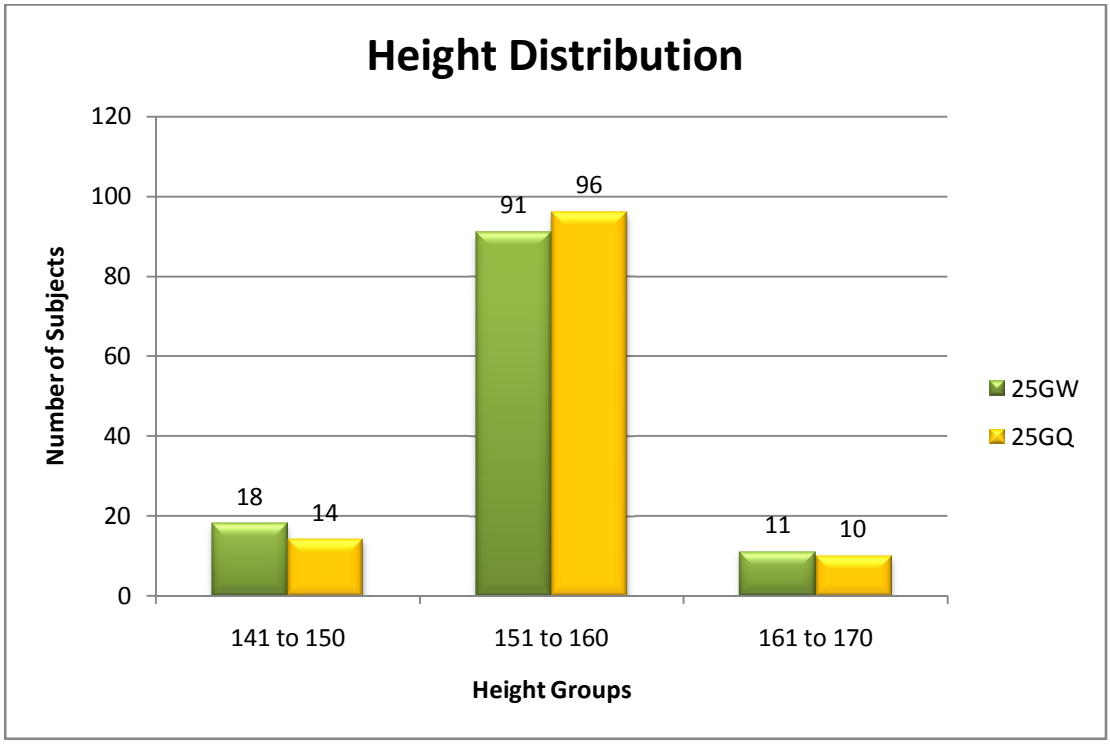


Age Distribution	25GW	%	25GQ	%
≤ 25	75	62.50	71	59.17
26 to 30	41	34.17	40	33.33
> 30	4	3.33	9	7.50
Total	120	100	120	100

	25GW	25GQ
N	120	120
Mean	25.00833	25.03333
SD	2.891587	3.159442
P value Unpaired t test	0.94907	

By conventional criteria the association between the Spinal Needle groups and age is considered to be not statistically significant since $p > 0.05$.

HEIGHT

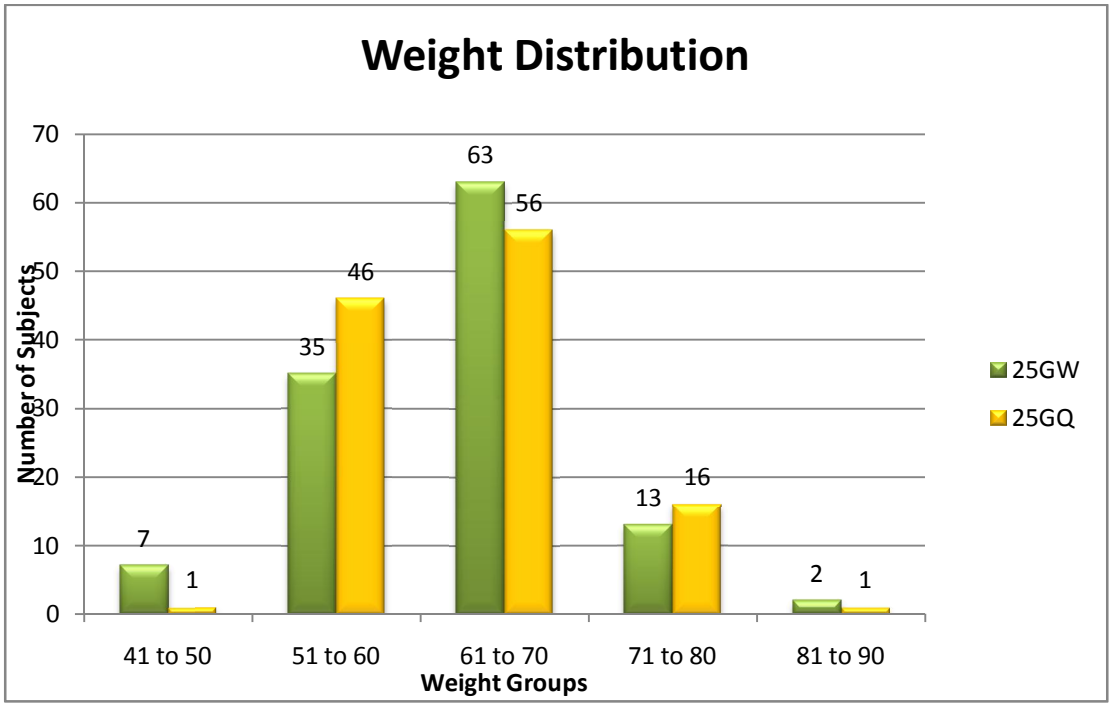


Height Distribution	25GW	%	25GQ	%
141 to 150	18	15.00	14	11.67
151 to 160	91	75.83	96	80.00
161 to 170	11	9.17	10	8.33
Total	120	100	120	100

	25GW	25GQ
N	120	120
Mean	155.4333	155.7083
SD	4.166157	4.013414
P value Unpaired t test	0.603023	

By conventional criteria the association between the Spinal Needle groups and Height is considered to be not statistically significant since p > 0.05.

WEIGHT



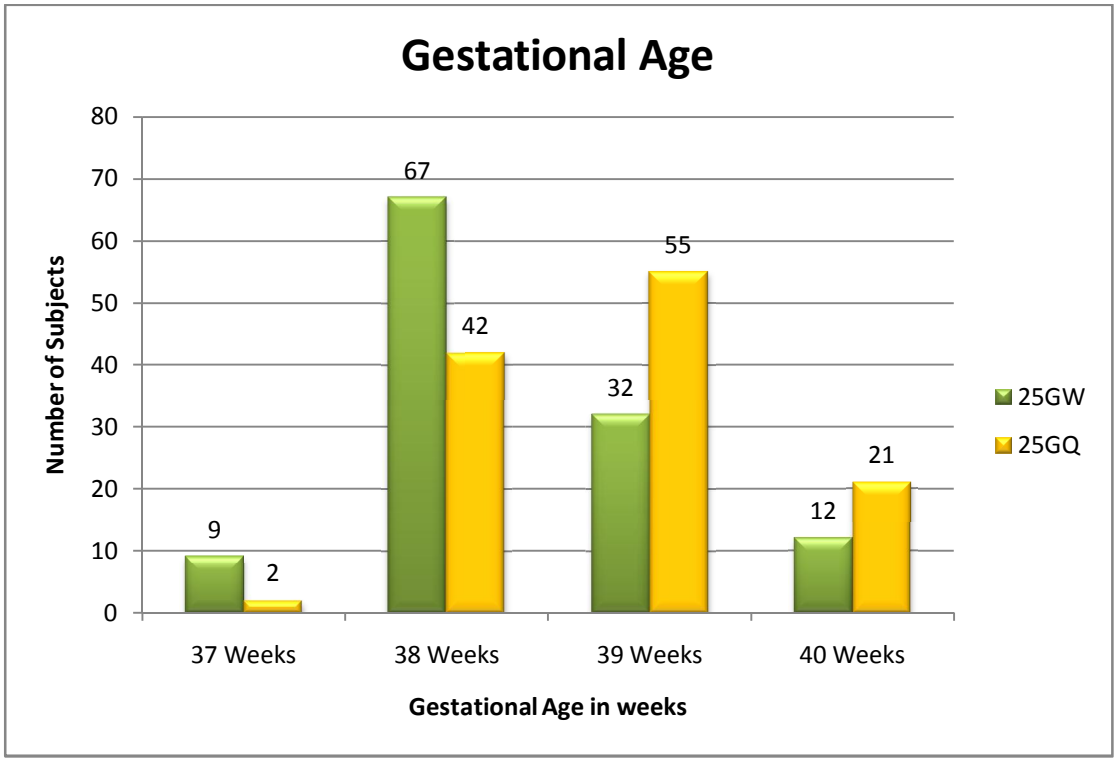
Weight Distribution	25GW	%	25GQ	%
41 to 50	7	5.83	1	0.83
51 to 60	35	29.17	46	38.33
61 to 70	63	52.50	56	46.67
71 to 80	13	10.83	16	13.33
81 to 90	2	1.67	1	0.83
Total	120	100	120	100

	25GW	25GQ
N	120	120
Mean	63.85833	63.51667
SD	7.515022	6.713818
P value Unpaired t test	0.710668	

By conventional criteria the association between the Spinal Needle groups and Weight is considered to be not statistically significant since $p > 0.05$.

Since age, height and weight are not statistically significant, it means that there is no difference between the groups. In other words the groups contain subjects with the same basic demographic characteristics.

GESTATIONAL AGE

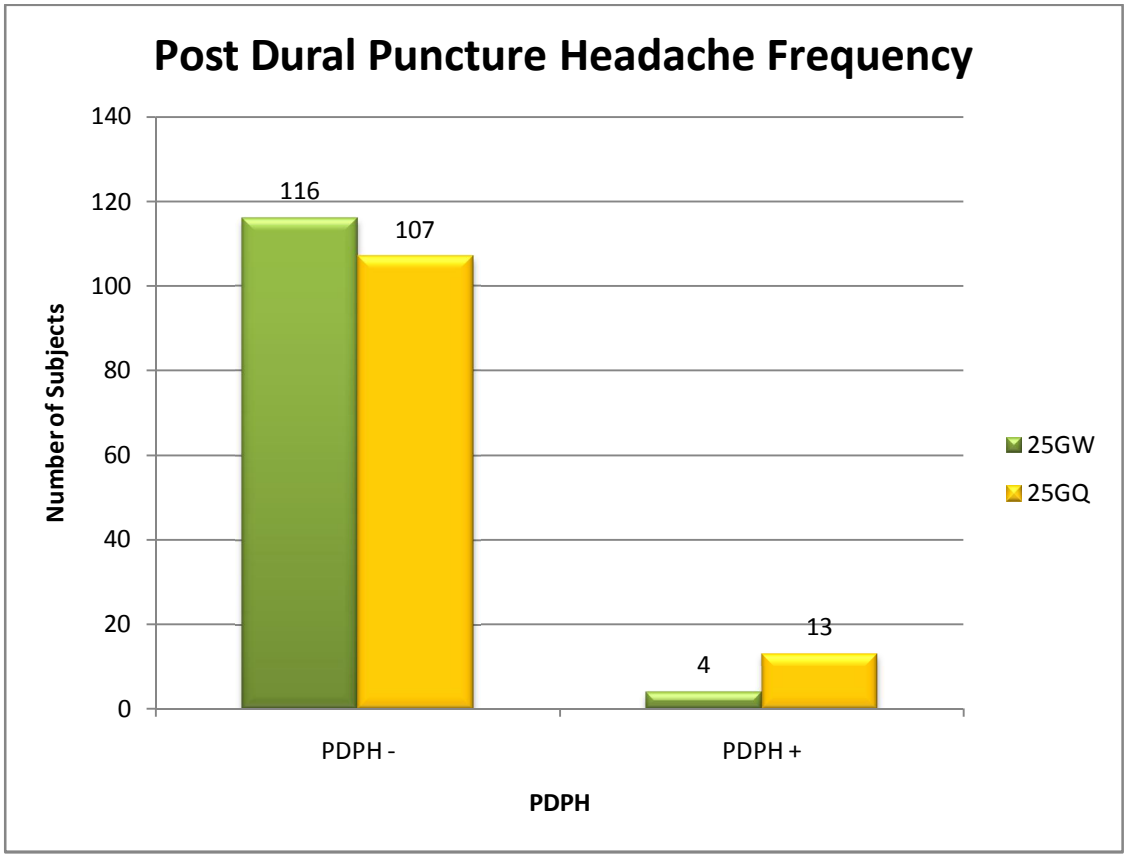


Gestational Age	25GW	%	25GQ	%
37 Weeks	9	7.50	2	1.67
38 Weeks	67	55.83	42	35.00
39 Weeks	32	26.67	55	45.83
40 Weeks	12	10.00	21	17.50
Total	120	100	120	100

	25GW	25GQ
N	120	120
Mean	37.88542	38.31083
SD	3.586618	3.60578
P value Unpaired t test	0.3604	

By conventional criteria the association between the Spinal Needle groups and Gestational age is considered to be not statistically significant since $p > 0.05$.

POST DURAL PUNCTURE HEADACHE FREQUENCY



Post Dural Puncture Headache Frequency	25GW	25GQ	Total -Row
PDPH -	116	107	223
PDPH +	4	13	17
Total - Column	120	120	240
chi-square	5.13		
degrees of freedom	1		
P value Chi-squared test	0.024		

Severity of Post Dural Puncture Headache	25GW	25GQ	Total -Row
Mild	2	4	6
Moderate	1	7	8
Severe	1	2	3
Total - Column	4	13	17
chi-square	1.02		
degrees of freedom	2		
P value Chi-squared test	0.600		

Onset of Post Dural Puncture Headache	25GW	25GQ	Total -Row
1st POD	0	0	0
2nd POD	3	9	12
3rd POD	1	4	5
Total - Column	4	13	17
chi-square	0.327		
degrees of freedom	2		
P value Chi-squared test	0.849		

By conventional criteria the association between the Spinal Needle Groups and Post Dural Puncture Headache is considered to be statistically significant since $p < 0.05$.

Statistical Significance

This indicates that there is a true difference among groups and the difference is significant. . In simple terms, inobstetric anaesthesia, the incidence of PDPH is less when pencil-point 25G Whiteacrespinal needle is used compared to Cutting bevelled 25G Quincke spinal needle. It is statistically significant with a p-value of 0.005 according to Chi-squared Test.

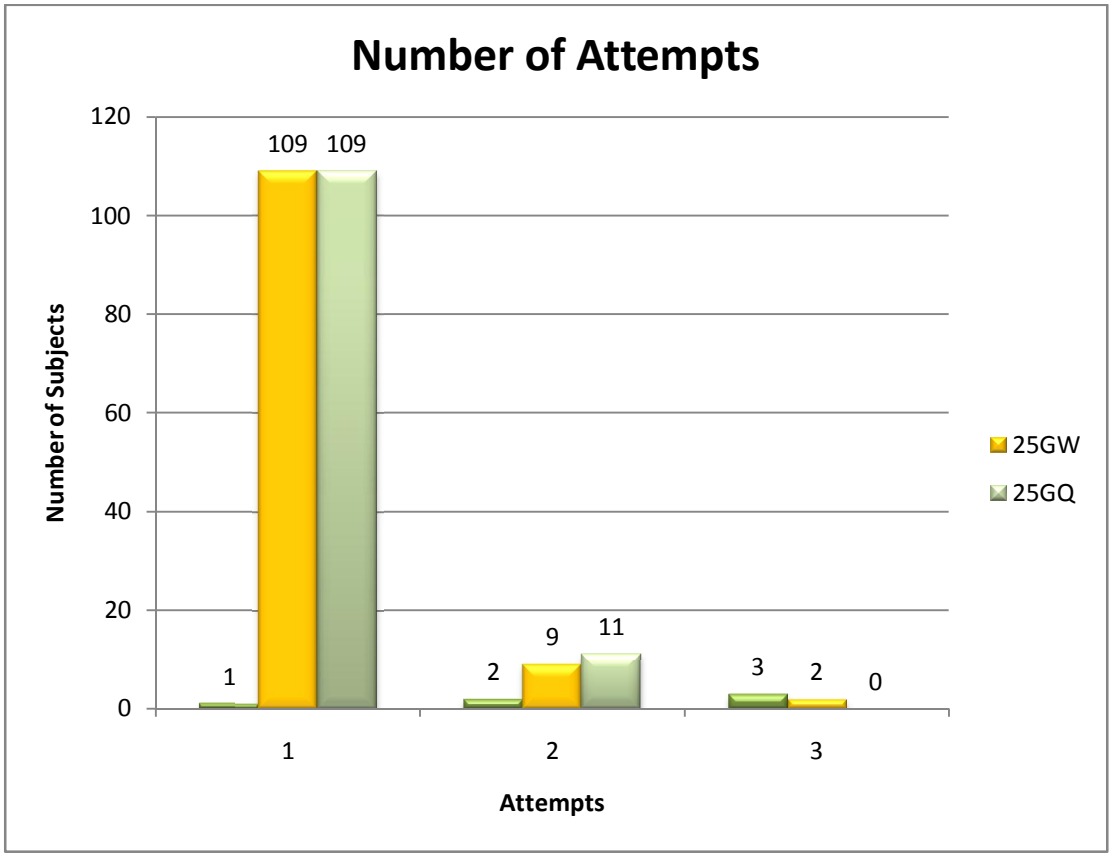
Clinical Significance

- The occurrence of PDPH was meaningfully less (3.3%) when pencil-point 25G Whiteacrespinal needles is used compared to Cutting bevelled 25G Quincke spinal needle (10.8%).

- It was mild in 6%, moderate in 12% and severe in 6% of patients in pencil-point 25G Whiteacrespinal needle group. It was mild in 29%, moderate in 35% and severe in 12% of patients in Cutting bevelled 25G Quincke spinal needle group.

This difference is true and significant and has not occurred by chance.

NUMBER OF ATTEMPTS

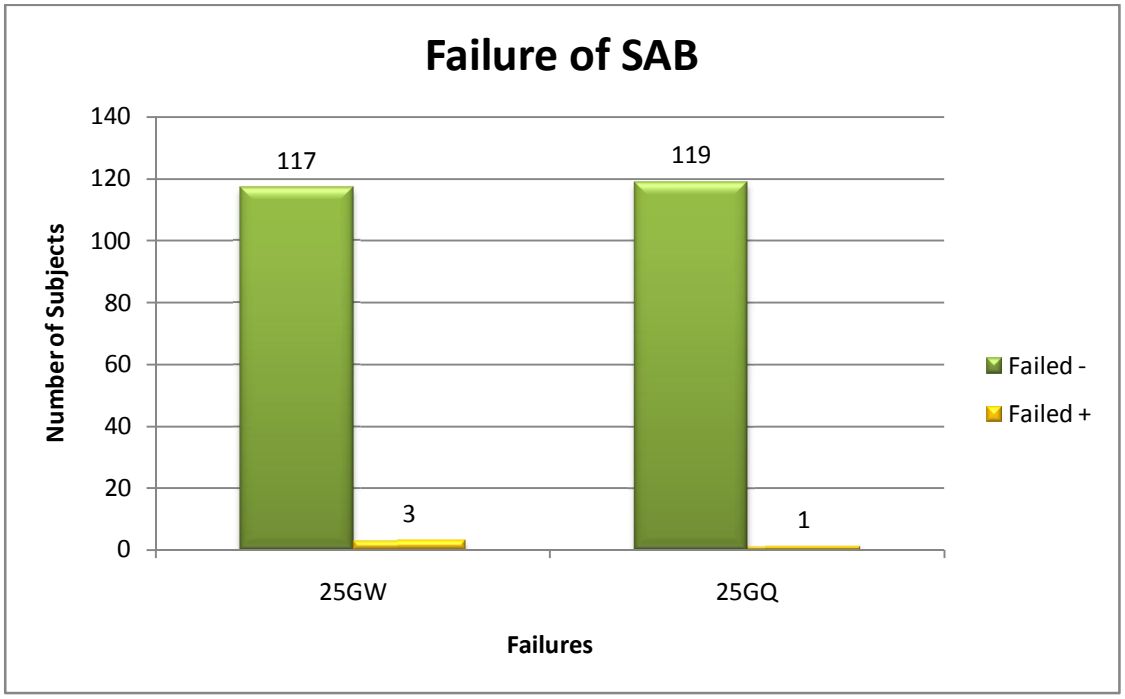


Number of Attempts	25GW	%	25GQ	%
1	109	90.83	109	90.83
2	9	7.50	11	9.17
3	2	1.67	0	0.00
Total	120	100	120	100

	25GW	25GQ
N	120	120
Mean	1.108333	1.091667
SD	0.36197	0.289765
P value Unpaired t test	0.6941	

By conventional criteria the association between the Spinal Needle groups and number of attempts is considered to be not statistically significant since $p > 0.05$.

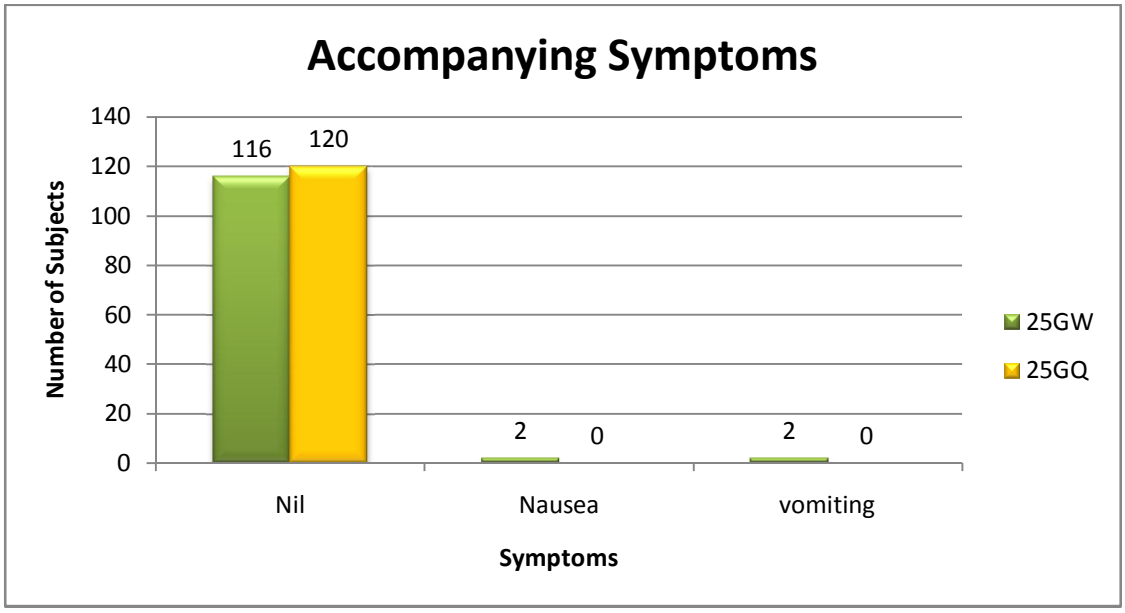
FAILURE OF SAB



Failure of SAB	25GW	%	25GQ	%
Failed -	117	97.50	119	99.17
Failed +	3	2.50	1	0.83
Total	120	100	120	100
chi-square	1.02			
degrees of freedom	1			
P value Chi-squared test	0.313			

By conventional criteria the association between the Spinal Needle groups and failure of SAB is considered to be not statistically significant since $p > 0.05$.

ACCOMPANYING SYMPTOMS



Accompanying Symptoms	25GW	%	25GQ	%
Nil	116	96.67	120	100.00
Nausea	2	1.67	0	0.00
Vomiting	2	1.67	0	0.00
Total	120	100	120	100
chi-square	2.91			
degrees of freedom	2			
P value Chi-squared test	0.233			

By conventional criteria the association between the Spinal Needle groups and accompanying symptoms is considered to be not statistically significant since $p > 0.05$.

DISCUSSION

DISCUSSION

The International Association Of Pain has defined Pain as "A conscious sensation of distress, suffering or agony with actual or atleast potential tissue damage''.

An Anaesthesiologist is one who renders the patient insensitive to pain.SAB is the commonest technique performed for LSCS.The pregnant patients are more prone for PDPH because of their young age,gender and greater use of walking Epidural technique.

As already stated, PDPH is due to loss of CSF through the dural puncture. This leads to lowering of CSF pressure causing traction on intracranial painful structures. There is a compensatory increase in intracranial blood volume according to Monro-Kellie Hypothesis.

Development of fine gauge spinal needles and needle tip modification has reduced the incidence of PDPH. Technical difficulty in identifying the space and risk of failed blocks should be balanced against the morbidity associated with PDPH.

Now-a-days 25gauge,26gauge and 27 gauge needles are recommended for SAB. Needles of 29 gauge or less are associated with increased failure rate and therefore not recommended.

Many studies favour Pencil tip or non-cutting type of needle for reducing the incidence and severity of PDPH.

In a study conducted in 300 patients,Campbell et al demonstrated a PDPH incidence of 0.66%(1/150) with 25gauge Whitacre needle.

Hwang JJ,HO ST et al demonstrated the incidence to be less with 25 gauge Whitacre in 90 women posted for LSCS.

In a study conducted by Vallejo et al in 1002 obstetric patients,using 5 types of spinal needle showed a reduced incidence and severity of PDPH with 25 gauge Whitacre needle.

Bano F et al showed an incidence of 0.75% with 25 gauge Whitacre in study involving 100 women.

My study is to compare the incidence of PDPH with 25 gauge spinal needle which is in common use. The study included 25 gauge Quincke and 25 gauge Whitacre needle.

In the present study of 240 obstetric patients, Age, Height, Weight, Gestational age are not statistically significant and are comparable.

The occurrence of PDPH was less with 25 gauge Whitacre (3.3%) than 25gauge Quincke(10.8%).It was mild in 6%,moderate in 12% and severe in 6% in 25 gauge Whitacre group.PDPH is mild in 29%,moderate in 35% and severe in 12% in 25 gauge Quincke group.

SUMMARY

SUMMARY

In summary, a randomized study in comparing the incidence of PDPH in obstetric patients posted for Elective LSCS, Using 25 gauge Quincke and 25 gauge Whitacre spinal needles showed the following results

- The occurrence of PDPH was meaningfully less when 25 gauge Whitacre (3.3%) is used compared to cutting bevelled 25 gauge Quincke needle (10.8%).
- It was mild in 6%,moderate in 12% and severe in 6% in Whitacre group.
- It was mild in 29%,moderate in 35% and severe in 12% in Quincke group.
- No difference in the number of attempts for successful blockade and number of failed blocks.
- The difference is true and significant with a p value of 0.005

CONCLUSION

CONCLUSION

We conclude that there is real advantage by using pencil-point 25G Whiteacrespinal needles in comparison to Cutting bevelled 25G Quincke spinal needle in terms of reducing incidence and severity of PDPH.

BIBLIOGRAPHY

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- PDPH : Pathogenesis, prevention and Treatment.D.K.Turnbell and D.B.Sheperd.Br.J.Anaesth(2003);91(5):718-729
- Vandom LD,Dripps RD.Long term follow-up of patients who received 10,098,spinal anaesthetics.Syndrome of decreased ICP(headache,ocular and auditory difficulty) JAMA 1956;161:586-91
- Eldor J Double hole pencil spinal needle.Regional Anaesthesia 1996;21:74-75
- Lybecker H,Mollar JT, May o,Neilson HK Incidence and prediction off PDPH.A prospective study of 1021 spinal anaesthesia.Anaesth.Analg 1990;70:389-40
- Lambert DH,HurleyRJ,Heatwing L,et al.Role of needle gauge and tip configuration in the production of lumbar puncture headache.Reg.Anaesth.1997;22:66-72
- Buettner J,Wresch K-P,Klose R.PDPH;Comparison of 25 gauge Whitacre and Quincke needle.Reg.Anaesth 1993;18:166-69
- History of spinal needles:getting into the point.N.Calthorpe Anaesthesia,volume 59:issue 12
- Jahangirs.Tip holed spinal needle;a new design concept.Regional anaesthesia and Pain medicine 2000;25:403-7
- Carrie Less,Collins PD.29 gauge spinal needle.Br.J.Anaesth 1991;66:145-6

- Halpen s,Preston R.PDPH and spinal needle design.meta analysis.Anaesthesiology 1994;81(6):1376-83
- Younggren B.N,Zeger W,Nolan R.CosyntropinVs Caffeine for PDPH.Acad .Emerg.med.2005;12(suppl 1):52-3
- Scavone B.M,Wong C.A,Sullaivan J.T ,et al.efficiency of a prophylactic EBP in preventing PDPH in parturients after inadvertent dural puncture.Anaesthesiology 2004;101:1422-7
- Ylonen P,Kokki H.Epidural blood patch for management of PDPH in adolescents. Acta anaesthesiol.scand.2002;46:794-8
- Crul B.J,Gerriste B.M;Van Dongen R.T;Schoonderwaldt H.C.Epidural fibrin glue injection stops persistant PDPH.Anaesthesiology 1999;91:576-77
- Zeiden A,Farhat o,Maali ki H,Baraka A.Does PDPH left untreated lead to SDH?Case report and review of literature. Int.J.Obstetric.Anaesth.2006;15:50-8
- Landman UN,Jerome R.M,Glass P.S SDH after atraumatic spinal.J.Clini Anaesthesia 2005;17:379-81
- Bano F,Haider S,Aftab S,Suitan.comparison of 25 gauge quincke and whitacre spinal needle in obstetric patients.J.coll physicians surg Pak 2004;14(11)
- Barker P.headache after dural puncture.Anaesthesia 1989;44;696-7

- CampbellDC,Douglas MJ,Pavy TJ,Merrick P,Flanagan ML COMPARISON OF 25 gauge Whitacre and 24 gauge sprotte needle for elective LSCS Can.J Anaesth 1993;40;1131-5

- Carrie LE Whiyacre and pencil-point needle;some points to consider Anaesthesia;45;1097-8

- Ross AW,Greenhaigh C,McGlade DP,et al.The sprotte needle and post dural puncture headache following caesarean section.Anaesth Interns care 1993;21;280-3

- Vallejo MC,MandellGL,Sabo DP,Ramanathan S.Postdural puncture headache ;a randomized comparison of 5 spinal needles in obstetricsAnaesth analg 2000;91;916-20

ANNEXURES

PATIENT CONSENT FORM

Study title :

"A Prospective, randomized study comparing the incidence of POSTDURAL PUNCTURE HEADACHE following spinal anaesthesia in obstetric patients using 25 gauge Whitacre spinal needle and Quincke spinal needle.

Study center :

Institute of Social Obstetrics,

Kasthurba Gandhi General Hospital For Women And Children,

Triplicane, Chennai-5.

Participant name : Age: Sex : FEMALE

I.P. NO

I confirm that I have understood the purpose of procedure for the above study . I have the opportunity to ask the question and all my questions and doubts have been answered to my satisfaction.

I have been explained about the pitfall in the procedure. I have been explained about the safety, advantage and disadvantage of the technique.

I understand that my participation in the study is voluntary and that I am free to withdraw at anytime without giving any reason.

I understand that investigator ,regulatory authorities and the ethics committee will not need my permission to look at my health records both in respect to current study and any further research that may be conducted in relation to it, even if I withdraw from the study . I understand that my identity will not be revealed in any information released to third parties or published , unless as required under the law . I agree not to restrict the use of any data or results that arise from the study .

Time:

Date: Signature / thumb impression

Place: Patient name:

Signature of the investigator:

Name of the investigator:

PROFORMA

NAME : AGE :

SEX : FEMALE WEIGHT :

HEIGHT : GESTATION:

INDICATION :

PREOP :

PRELOADING :

MONITORS :

TIME	PR	NIBP	SPO2	IVF

H/O HEADACHE	DAY 1	DAY 2	DAY 3
ONSET			
CHARACTER			
SITE			
DURATION			
AGGREVATING			
RELIEVING			
OTHERS			

TREATMENT:

NUMBER OF ATTEMPTS :

FAILED SPINAL BLOCK :

DURATION OF SURGERY :

	25 GAUGE WHITACRE SPINAL NEEDLE GROUP													
S NO	**IP NO**	**AGE**	**HEIGHT**	**WEIGHT**	**G.AGE**	**DAY 1 PDPH**	**DAY 2 PDPH**	**DAY 3 PDPH**	**Severity of PDPH**	**ATTEMPTS**	**FAILED**	**NAUSEA**	**VOMITING**	**OTHERS**
1	4636	25	155	66	37.04	0	0	0	0	1	0	0	0	0
2	4667	23	162	64	40	0	0	0	0	1	0	0	0	0
3	4882	28	158	69	37.7	0	0	0	0	1	0	0	0	0
4	4895	24	158	60	37.9	0	0	0	0	1	0	0	0	0
5	5136	28	158	65	38.3	0	0	0	0	1	0	0	0	0
6	5155	24	150	68	40	0	0	0	0	2	0	0	0	0
7	5157	22	154	65	38	0	0	0	0	1	0	0	0	0
8	5176	25	155	70	38.3	0	0	0	0	1	0	0	0	0
9	5178	23	160	72	37	0	0	0	0	1	0	0	0	0
10	5206	22	158	68	38	0	0	0	0	1	0	0	0	0
11	5222	24	150	67	37	0	0	0	0	1	0	0	0	0
12	5240	30	155	65	37.3	0	0	0	0	1	0	0	0	0
13	5253	25	159	66	37.03	0	0	0	0	1	0	0	0	0
14	5254	23	159	55	38.06	0	0	0	0	2	0	0	0	0
15	5257	25	155	65	37.6	0	0	0	0	1	0	0	0	0
16	5298	23	160	62	37.03	0	0	0	0	1	0	0	0	0
17	5306	27	155	68	40	0	0	0	0	1	0	0	0	0
18	5329	33	144	70	38	0	0	0	0	1	0	0	0	0
19	5340	27	153	65	37.7	0	0	0	0	3	0	0	0	0
20	5415	23	156	65	37	0	0	0	0	1	0	0	0	0

S NO	IP NO	AGE	HEIGHT	WEIGHT	G.AGE	DAY 1 PDPH	DAY 2 PDPH	DAY 3 PDPH	Severity of PDPH	ATTEMPTS	FAILED	NAUSEA	VOMITING	OTHERS
21	5421	25	154	62	38	0	0	0	0	1	0	0	0	0
22	5422	26	154	49	37.4	0	0	0	0	2	0	0	0	0
23	5465	25	160	62	38.06	0	0	0	0	1	0	0	0	0
24	5520	25	148	50	37.6	0	0	0	0	1	0	0	0	0
25	5528	28	151	68	38.4	0	0	0	0	2	0	0	0	0
26	5560	26	158	58	37.3	0	0	0	0	1	0	0	0	0
27	5641	25	153	54	39	0	0	0	0	1	0	0	0	0
28	5648	26	156	69	37.03	0	0	0	0	1	0	0	0	0
29	5657	28	151	60	38	0	0	0	0	1	0	0	0	0
30	5677	23	154	70	38.3	0	0	0	0	1	0	0	0	0
31	5698	26	146	50	37.04	0	0	0	0	1	0	0	0	0
32	5699	25	147	50	37.7	0	0	0	0	1	0	0	0	0
33	5711	31	149	52	38	0	0	0	0	1	0	0	0	0
34	5732	22	151	60	38	0	0	0	0	1	0	0	0	0
35	5774	26	152	60	37.4	0	0	0	0	1	0	0	0	0
36	5836	28	158	76	38.4	0	0	0	0	1	0	0	0	0
37	5882	22	156	60	37	0	0	0	0	1	0	0	0	0
38	5891	23	156	60	38.3	0	0	0	0	1	1	0	0	0
39	5895	20	156	65	37.03	0	0	0	0	1	0	0	0	0
40	5898	23	158	67	38	0	0	0	0	1	0	0	0	0
41	5972	23	145	45	38	0	0	0	0	1	0	0	0	0

S NO	IP NO	AGE	HEIGHT	WEIGHT	G.AGE	DAY 1 PDPH	DAY 2 PDPH	DAY 3 PDPH	Severity of PDPH	ATTEMPTS	FAILED	NAUSEA	VOMITING	OTHERS
42	5990	23	154	55	37.6	0	0	0	0	1	0	0	0	0
43	5992	26	150	60	38	0	0	0	0	1	0	0	0	0
44	5999	30	154	58	37	0	0	0	0	1	0	1	1	0
45	6051	23	155	65	38	0	0	0	0	1	0	0	0	0
46	6074	22	160	60	37	0	0	0	0	1	0	0	0	0
47	6332	28	158	62	38.07	0	0	0	0	1	0	0	0	0
48	6355	24	162	60	38	0	0	0	0	1	0	0	0	0
49	6422	24	148	76	38	0	0	0	0	1	0	0	0	0
50	6470	26	154	63	37.06	0	0	0	0	1	0	0	0	0
51	6518	25	148	69	38	0	0	0	0	1	0	0	0	0
52	6525	24	154	66	38	0	0	0	0	2	0	0	0	0
53	6532	29	153	75	38	0	0	0	0	1	0	0	0	0
54	6589	23	157	56	37	0	0	0	0	1	0	0	0	0
55	6667	24	160	62	37.07	0	0	0	0	1	0	0	0	0
56	6676	28	156	65	38	0	0	0	0	2	0	0	0	0
57	6742	27	154	53	38	0	0	0	0	1	0	0	0	0
58	6743	30	156	85	37.06	0	0	0	0	2	0	0	0	0
59	6756	27	158	62	38	0	0	0	0	1	0	0	0	0
60	6800	28	159	68	38	0	0	0	0	1	0	0	0	0
61	6807	20	159	63	38	0	0	0	0	1	0	0	0	0
62	6842	21	147	58	38	0	0	0	0	1	0	0	0	0

S NO	IP NO	AGE	HEIGHT	WEIGHT	G.AGE	DAY 1 PDPH	DAY 2 PDPH	DAY 3 PDPH	Severity of PDPH	ATTEMPTS	FAILED	NAUSEA	VOMITING	OTHERS
63	6852	20	153	53	38	0	0	0	0	1	0	1	1	0
64	6866	29	153	75	37	0	0	0	0	1	0	0	0	0
65	6883	28	161	64	39	0	0	0	0	1	0	0	0	0
66	6901	28	164	66	38	0	0	0	0	1	0	0	0	0
67	6902	24	155	65	39	0	0	0	0	3	0	0	0	0
68	6906	21	162	74	38.04	0	0	0	0	1	0	0	0	0
69	6921	23	161	80	38	0	0	0	0	1	0	0	0	0
70	6945	21	153	49	40	0	0	0	0	1	0	0	0	0
71	6969	26	153	59	40	0	0	0	0	1	0	0	0	0
72	7025	28	156	60	37.06	0	0	0	0	1	0	0	0	0
73	7029	22	153	59	39	0	0	0	0	1	0	0	0	0
74	7161	28	156	55	37	0	0	0	0	1	0	0	0	0
75	7163	21	158	54	39	0	0	0	0	1	1	0	0	0
76	7247	25	162	66	38	0	0	0	0	1	0	0	0	0
77	7249	31	161	54	39	0	1	0	1	1	0	0	0	0
78	7259	27	149	59	39	0	0	0	0	1	0	0	0	0
79	7310	21	154	77	38	0	0	0	0	1	0	0	0	0
80	7335	24	160	62	38	0	0	0	0	1	0	0	0	0
81	7348	23	159	80	40	0	0	0	0	2	0	0	0	0
82	7349	30	149	56	39	0	0	0	0	1	1	0	0	0
83	7360	21	158	68	38	0	0	0	0	1	0	0	0	0

S NO	IP NO	AGE	HEIGHT	WEIGHT	G.AGE	DAY 1 PDPH	DAY 2 PDPH	DAY 3 PDPH	Severity of PDPH	ATTEMPTS	FAILED	NAUSEA	VOMITING	OTHERS
84	7396	22	153	70	39	0	0	0	0	1	0	0	0	0
85	7397	23	157	58	38.3	0	0	0	0	2	0	0	0	0
86	7399	29	154	70	38	0	0	0	0	1	0	0	0	0
87	7400	30	154	65	40	0	0	0	0	1	0	0	0	0
88	7401	25	157	76	38	0	0	0	0	1	0	0	0	0
89	7405	22	160	65	40	0	0	0	0	1	0	0	0	0
90	7414	23	148	55	38	0	0	0	0	1	0	0	0	0
91	7423	25	159	87	38	0	1	0	1	1	0	0	0	0
92	7431	23	157	50	38	0	0	0	0	1	0	0	0	0
93	7432	24	156	60	38	0	0	0	0	1	0	0	0	0
94	7453	28	154	74	39	0	0	0	0	1	0	0	0	0
95	7569	23	149	58	38	0	0	0	0	1	0	0	0	0
96	7588	22	162	70	38	0	0	0	0	1	0	0	0	0
97	7606	32	150	58	38.07	0	0	0	0	1	0	0	0	0
98	7621	22	158	65	39	0	1	0	2	1	0	0	0	0
99	7629	24	155	60	38	0	0	0	0	1	0	0	0	0
100	7687	21	157	76	38	0	0	0	0	1	0	0	0	0
101	7818	29	155	76	40	0	0	0	0	1	0	0	0	0
102	7822	26	150	64	39	0	0	0	0	1	0	0	0	0
103	7965	30	160	63	38	0	0	0	0	1	0	0	0	0
104	8008	23	159	60	40	0	0	0	0	1	0	0	0	0

S NO	IP NO	AGE	HEIGHT	WEIGHT	G.AGE	DAY 1 PDPH	DAY 2 PDPH	DAY 3 PDPH	Severity of PDPH	ATTEMPTS	FAILED	NAUSEA	VOMITING	OTHERS
105	8070	27	156	70	38	0	0	0	0	1	0	0	0	0
106	8084	30	159	64	39	0	0	0	0	1	0	0	0	0
107	8097	25	159	66	38	0	0	0	0	1	0	0	0	0
108	8104	24	162	65	39	0	0	0	0	1	0	0	0	0
109	8110	24	160	68	38	0	0	0	0	1	0	0	0	0
110	8115	22	161	65	38	0	0	0	0	1	0	0	0	0
111	8147	27	155	68	39	0	0	1	3	1	0	0	0	0
112	8181	23	154	65	39	0	0	0	0	1	0	0	0	0
113	8183	25	153	66	38	0	0	0	0	1	0	0	0	0
114	8199	25	155	59	39	0	0	0	0	1	0	0	0	0
115	8204	24	154	62	39	0	0	0	0	1	0	0	0	0
116	8221	26	158	64	39	0	0	0	0	1	0	0	0	0
117	8301	24	158	65	38	0	0	0	0	1	0	0	0	0
118	8304	22	159	64	40	0	0	0	0	1	0	0	0	0
119	8305	20	153	64	40	0	0	0	0	1	0	0	0	0
120	8316	24	159	70	39	0	0	0	0	1	0	0	0	0

	25 GAUGE QUINCKE SPINAL NEEDLE GROUP													
S. No.	IP NO	AGE	HEIGHT	WEIGHT	G.AGE	DAY 1 PDPH	DAY 2 PDPH	DAY 3 PDPH	Severity of PDPH	ATTEMPTS	FAILED	NAUSEA	VOMITING	OTHERS
1	5860	26	154	60	39	0	0	0	0	1	0	0	0	0
2	5947	22	150	57	38	0	0	0	0	1	0	0	0	0
3	5974	22	154	62	38	0	0	0	0	1	0	0	0	0
4	5987	26	150	64	38.3	0	0	0	0	1	0	0	0	0
5	6229	28	159	68	38	0	0	0	0	2	0	0	0	0
6	6249	26	155	65	40	0	0	0	0	1	0	0	0	0
7	6348	24	158	60	38.4	0	0	0	0	1	0	0	0	0
8	6349	31	154	75	39	0	0	0	0	1	0	0	0	0
9	6351	23	162	66	37	0	0	0	0	1	0	0	0	0
10	6355	25	156	64	38.3	0	0	0	0	2	0	0	0	0
11	6363	26	164	67	38.3	0	0	0	0	1	0	0	0	0
12	6495	28	157	80	38	0	0	0	0	1	0	0	0	0
13	6522	22	152	62	38	0	0	0	0	1	0	0	0	0
14	6524	20	152	55	40	0	0	0	0	1	0	0	0	0
15	6525	24	154	66	39	0	0	0	0	1	0	0	0	0
16	6575	20	156	68	37	0	0	0	0	1	0	0	0	0
17	6609	27	159	75	38	0	0	0	0	1	0	0	0	0
18	6629	27	160	74	39	0	0	0	0	1	0	0	0	0
19	6631	23	162	60	38	0	0	0	0	1	0	0	0	0
20	6634	31	154	75	38.4	0	0	0	0	1	0	0	0	0

S. No.	IP NO	AGE	HEIGHT	WEIGHT	G.AGE	DAY 1 PDPH	DAY 2 PDPH	DAY 3 PDPH	Severity of PDPH	ATTEMPTS	FAILED	NAUSEA	VOMITING	OTHERS
21	6640	27	154	70	38	0	0	1	1	1	0	0	0	0
22	6644	22	150	67	39	0	0	0	0	1	0	0	0	0
23	6672	23	149	56	39	0	0	0	0	2	0	0	0	0
24	6673	25	152	73	39	0	0	0	0	1	0	0	0	0
25	6682	27	154	54	40	0	0	0	0	1	0	0	0	0
26	6684	24	158	62	39.4	0	0	0	0	1	0	0	0	0
27	6703	24	159	60	39	0	0	0	0	1	0	0	0	0
28	6712	31	158	60	40	0	0	0	0	1	0	0	0	0
29	6728	26	157	60	38.3	0	0	0	0	1	0	0	0	0
30	6731	20	156	63	39	0	0	1	2	1	0	0	0	0
31	6734	21	158	67	39	0	0	0	0	1	0	0	0	0
32	6742	22	155	65	38.3	0	0	0	0	1	0	0	0	0
33	6744	25	157	57	38	0	0	0	0	1	0	0	0	0
34	6745	20	155	52	38	0	0	0	0	1	0	0	0	0
35	6749	30	157	52	38.7	0	0	0	0	1	0	0	0	0
36	6757	32	157	73	39	0	0	0	0	2	0	0	0	0
37	6790	25	159	65	39	0	0	0	0	1	0	0	0	0
38	6808	22	160	70	39	0	0	0	0	2	0	0	0	0
39	6813	28	158	76	39	0	0	0	0	1	0	0	0	0
40	6825	26	159	70	38	0	0	0	0	1	0	0	0	0
41	6852	24	158	64	37.4	0	1	0	1	2	0	0	0	0

S. No.	IP NO	AGE	HEIGHT	WEIGHT	G.AGE	DAY 1 PDPH	DAY 2 PDPH	DAY 3 PDPH	Severity of PDPH	ATTEMPTS	FAILED	NAUSEA	VOMITING	OTHERS
42	6860	25	160	69	39	0	0	0	0	1	0	0	0	0
43	6885	21	156	62	38	0	0	0	0	2	0	0	0	0
44	6896	25	152	64	38	0	0	0	0	1	0	0	0	0
45	6977	27	149	55	37.9	0	0	0	0	1	0	0	0	0
46	7000	27	160	65	39.3	0	0	0	0	1	0	0	0	0
47	7024	24	161	55	38.7	0	0	0	0	1	0	0	0	0
48	7027	26	153	59	39	0	0	0	0	1	0	0	0	0
49	7032	24	154	60	39	0	0	0	0	1	0	0	0	0
50	7045	28	159	62	38.6	0	0	0	0	2	0	0	0	0
51	7048	24	152	69	40	0	0	0	0	1	0	0	0	0
52	7059	24	154	70	40	0	0	0	0	1	0	0	0	0
53	7107	23	161	65	38	0	0	0	0	1	0	0	0	0
54	7135	25	158	61	38	0	0	0	0	1	0	0	0	0
55	7140	24	154	65	37.6	0	0	0	0	1	0	0	0	0
56	7146	29	157	64	38	0	0	0	0	1	0	0	0	0
57	7149	24	159	65	39	0	0	0	0	1	0	0	0	0
58	7165	31	155	72	40	0	0	0	0	1	0	0	0	0
59	7201	29	154	60	38.3	0	0	0	0	1	0	0	0	0
60	7219	24	159	68	39	0	0	0	0	2	0	0	0	0
61	7241	27	155	56	40	0	0	0	0	1	0	0	0	0
62	7259	27	152	64	39	0	0	0	0	1	0	0	0	0

S. No.	IP NO	AGE	HEIGHT	WEIGHT	G.AGE	DAY 1 PDPH	DAY 2 PDPH	DAY 3 PDPH	Severity of PDPH	ATTEMPTS	FAILED	NAUSEA	VOMITING	OTHERS
63	7303	24	150	66	39	0	0	0	0	1	0	0	0	0
64	7340	29	158	60	38	0	0	0	0	1	0	0	0	0
65	7394	29	150	75	39	0	0	0	0	2	0	0	0	0
66	7402	22	158	63	38	0	0	0	0	2	0	0	0	0
67	7470	28	158	62	38	0	1	0	2	1	0	0	0	0
68	7535	25	157	60	40	0	0	0	0	1	0	0	0	0
69	7559	25	158	55	40	0	0	0	0	1	0	0	0	0
70	7611	20	158	52	37.4	0	0	0	0	1	0	0	0	0
71	7627	28	166	70	375d	0	0	0	0	1	0	0	0	0
72	7662	21	148	50	39	0	0	0	0	1	0	0	0	0
73	7704	25	145	55	38.7	0	0	0	0	1	1	0	0	0
74	7823	22	142	59	38	0	0	0	0	1	0	0	0	0
75	7872	28	155	76	39	0	0	0	0	1	0	0	0	0
76	7927	23	152	53	39	0	0	0	0	1	0	0	0	0
77	8075	20	160	68	37.3	0	1	0	1	1	0	0	0	0
78	8101	26	158	60	39	0	0	0	0	1	0	0	0	0
79	8116	27	145	57	38.4	0	0	0	0	1	0	0	0	0
80	8122	22	159	67	38	0	0	0	0	1	0	0	0	0
81	8149	20	156	56	39	0	0	0	0	1	0	0	0	0
82	8156	23	161	56	37.4	0	1	0	1	1	0	0	0	0
83	8220	31	154	53	39	0	0	0	0	1	0	0	0	0

S. No.	IP NO	AGE	HEIGHT	WEIGHT	G.AGE	DAY 1 PDPH	DAY 2 PDPH	DAY 3 PDPH	Severity of PDPH	ATTEMPTS	FAILED	NAUSEA	VOMITING	OTHERS
84	8245	22	161	53	38	0	0	0	0	1	0	0	0	0
85	8268	27	157	69	38	0	0	0	0	1	0	0	0	0
86	8288	31	156	56	39	0	0	0	0	1	0	0	0	0
87	8297	26	156	56	40	0	0	0	0	1	0	0	0	0
88	8299	28	150	60	38	0	0	0	0	1	0	0	0	0
89	8353	30	149	59	37.4	0	0	0	0	1	0	0	0	0
90	8367	22	153	60	38	0	1	0	2	1	0	0	0	0
91	8380	23	148	60	40	0	1	0	2	1	0	0	0	0
92	8412	20	155	59	38.4	0	0	0	0	1	0	0	0	0
93	8437	23	158	74	38	0	0	0	0	1	0	0	0	0
94	8475	29	162	65	39.1	0	0	0	0	1	0	0	0	0
95	8565	24	160	66	38	0	1	0	3	1	0	0	0	0
96	8602	32	157	62	38	0	0	0	0	1	0	0	0	0
97	8612	23	158	74	39.3	0	1	0	2	1	0	0	0	0
98	8641	24	152	57	38.6	0	0	0	0	1	0	0	0	0
99	8645	24	155	65	38.4	0	0	0	0	1	0	0	0	0

S. No.	IP NO	AGE	HEIGHT	WEIGHT	G.AGE	DAY 1 PDPH	DAY 2 PDPH	DAY 3 PDPH	Severity of PDPH	ATTEMPTS	FAILED	NAUSEA	VOMITING	OTHERS
100	8652	26	155	57	39.3	0	0	0	0	1	0	0	0	0
101	8662	24	162	82	38	0	0	0	0	1	0	0	0	0
102	8668	25	157	65	38.3	0	1	0	3	1	0	0	0	0
103	8675	21	153	75	38	0	0	0	0	1	0	0	0	0
104	8699	24	156	70	40	0	0	0	0	1	0	0	0	0
105	8706	20	151	60	38.4	0	0	0	0	1	0	0	0	0
106	8723	23	160	76	38	0	0	0	0	1	0	0	0	0
107	8728	21	155	73	39	0	0	0	0	1	0	0	0	0
108	8736	23	151	55	38.3	0	0	0	0	1	0	0	0	0
109	8754	26	156	65	40	0	0	0	0	1	0	0	0	0
110	8769	23	154	55	39	0	0	1	2	1	0	0	0	0
111	8775	26	152	65	39	0	0	0	0	1	0	0	0	0
112	8777	25	153	58	40	0	0	0	0	1	0	0	0	0
113	8778	20	154	64	39	0	0	0	0	1	0	0	0	0
114	8796	22	158	64	38	0	0	0	0	1	0	0	0	0
115	8818	28	156	68	38.7	0	0	0	0	1	0	0	0	0
116	8824	25	158	59	40	0	0	1	2	1	0	0	0	0
117	8826	22	159	65	38	0	0	0	0	1	0	0	0	0
118	8833	28	158	62	38	0	0	0	0	1	0	0	0	0
119	8862	30	157	63	39	0	0	0	0	1	0	0	0	0
120	8899	33	159	64	39	0	0	0	0	1	0	0	0	0

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Subarachnoid block is the widely used technique by the anaesthesiologist worldwide. Spinal anaesthesia dates back to late 1800 with the work of Wynter,Quincke and Corning. However Dr.Karl August Bier is given the credit for introducing spinal anaesthesia in clinical practice in 1898.

The main advantage of SAB is due to its

- simplicity.

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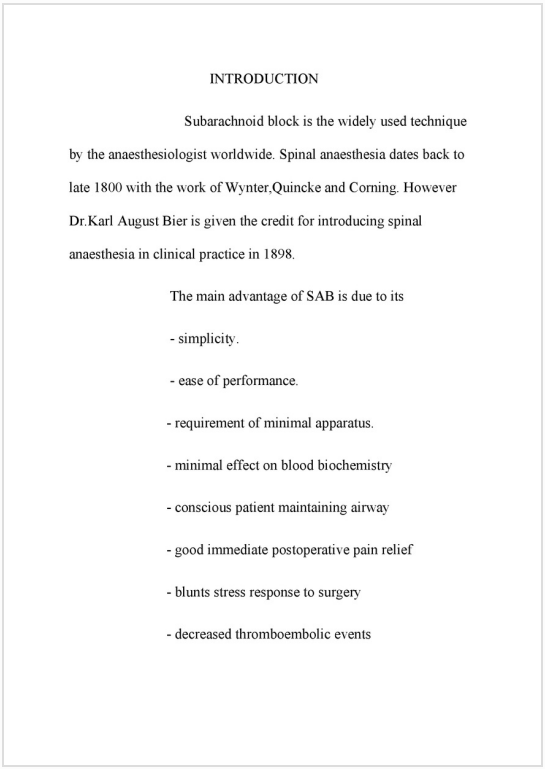

INTRODUCTION

Subarachnoid block is the widely used technique by the anaesthesiologist worldwide. Spinal anaesthesia dates back to late 1800 with the work of Wynter,Quincke and Corning. However Dr.Karl August Bier is given the credit for introducing spinal anaesthesia in clinical practice in 1898.

The main advantage of SAB is due to its

- simplicity.
- ease of performance.
- requirement of minimal apparatus.
- minimal effect on blood biochemistry
- conscious patient maintaining airway
- good immediate postoperative pain relief
- blunts stress response to surgery
- decreased thromboembolic events

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